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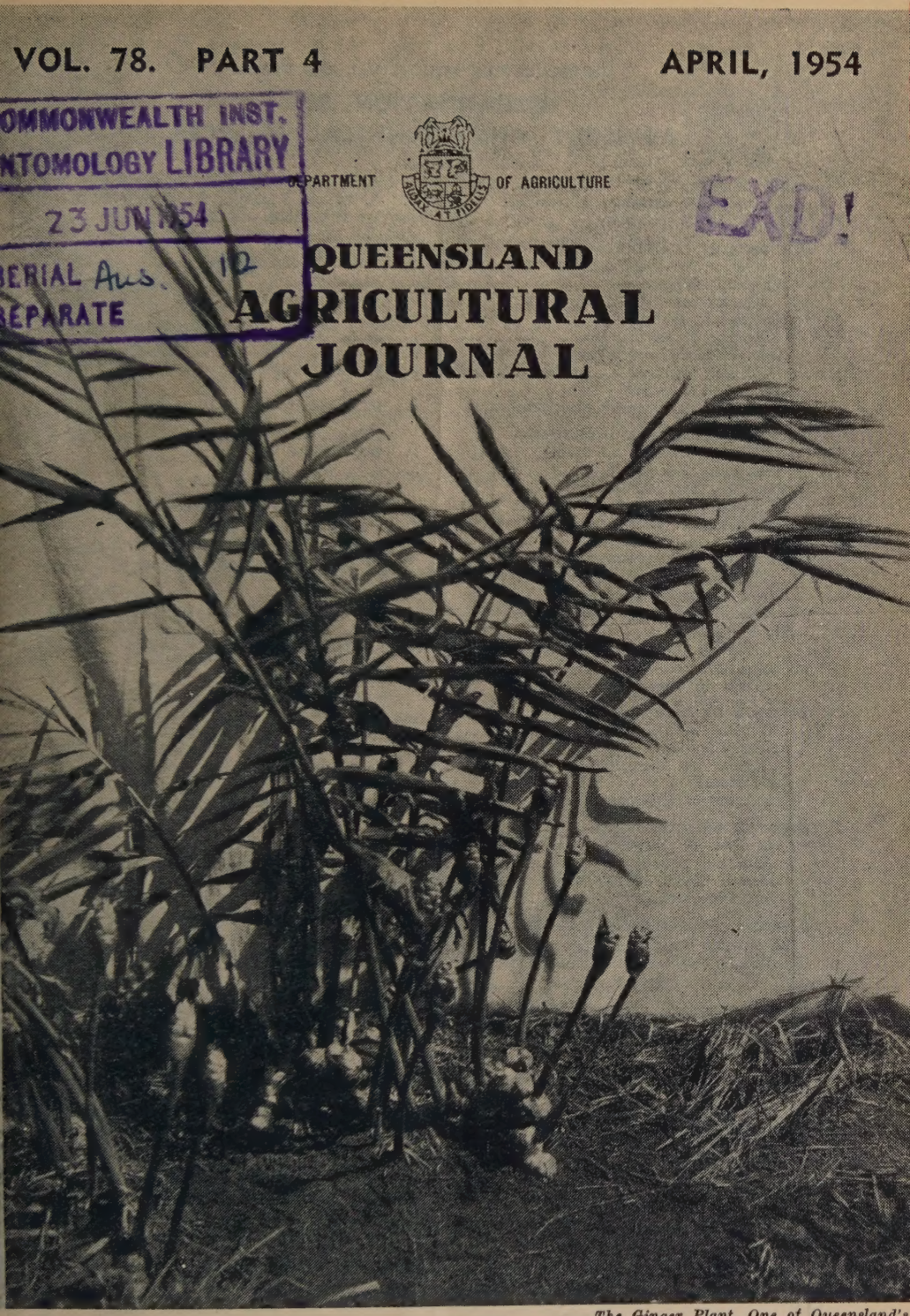

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Sweet Sudan Grass
Cattle Tick Control
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## TESTED HERDS (As at 15th March, 1954).

The Tuberculosis-Free Herd Scheme (which is distinct from the tuberculosis eradication scheme operating in commercial dairy herds) was initiated by the Department of Agriculture and Stock for the purpose of assisting owners of cattle studs to maintain their herds free from tuberculosis and so create a reservoir of tuberculosis-free cattle from which intending purchasers can draw their requirements.

The studs listed here have fulfilled the conditions to the date shown above.

Full particulars of the scheme and Agreement for Testing forms may be obtained from the Under Secretary, Department of Agriculture and Stock, Brisbane, or from Divisional Veterinary Officers throughout the State.

| Breed. | Owner's Name and Address. |
|---|---|
| Aberdeen Angus .. .. | The Scottish Australian Company Ltd., Texas Station, Texas<br>F. H. Hutton, "Bingegang," Dingo |
| A.I.S. .. .. .. | M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy<br>F. B. Sullivan, "Fermanagh," Pittsworth<br>D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth<br>W. Henschell, "Yarranvale," Yarranlea<br>Con. O'Sullivan, "Navillus" Stud, Greenmount<br>H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest<br>J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy<br>Sullivan Bros. "Valera'" Stud, Pittsworth<br>Reushle Bros., "Reubydale" Stud, Ravensbourne<br>H. F. Marquardt, "Chelmer" Stud, Wondai<br>W. G. Marquardt, "Springlands," Wondai<br>A. C. and C. R. Marquardt, "Cedar Valley," Wondai<br>A. H. Sokoll, "Sunny Crest" Stud, Wondai<br>W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt<br>G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar<br>C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman<br>W. H. Thompson, "Alfa Vale," Nanango<br>S. R. Moore, Sunnyside, West Wooroolin<br>H.M. State Farm, Numinbah<br>D. G. Neale, "Groveley," M.S. 195, Pittsworth<br>Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy<br>A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah<br>W. D. Davis, "Wamba" Stud, Chinchilla<br>Queensland Agricultural High School and College, Lawes<br>C. K. Roche, Freestone, Warwick<br>Mrs. K. Henry, Greenmount<br>D. R. Green, Deloraine Stud, Durong, Proston |
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| Polled Hereford .. .. | W. Maller, "Boreview," Pickanjinnie<br>J. H. Anderson, "Inverary," Yandilla<br>D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick |

# Sweet Sudan Grass—A New Variety.

J. A. KERR (Plant Breeder) and A. C. ARVIER (Assistant Agronomist), Agriculture Branch.

The original Sweet Sudan grass was produced by plant breeders of the Texas Agricultural Experiment Station in the United States of America, and resulted from a cross between Sudan grass and a variety of sweet sorghum known as Leoti. The aim of this cross was to produce a more palatable and nutritious fodder than the existing strains of Sudan grass, and one with greater resistance to leaf diseases.

The resultant variety has little similarity to the sorghum parent, selection from the cross having been concentrated on the production of strains similar in general type to Sudan grass. However, although a true Sudan grass type, this variety is easily distinguished from common Sudan grass. It is more compact in habit and very free stooling, and it normally lacks the excessive height frequently reached by common Sudan grass varieties. In addition, the leaf midribs are cloudy rather than white, the heads are smaller, and the seeds (which are enclosed in glossy tan hulls) are somewhat larger than the seeds of Roma or other varieties of common Sudan grass. Table 1 sets out the main points of difference between the new variety and the older common Sudan grass varieties.

## Local History.

A small seed sample of Sweet Sudan grass was received in Queensland six years ago, and increase of the seed supply was immediately commenced. However, a considerable variation in plant habit was noted. Plants ranged from early to late maturing, from dwarf to semi-tall, and from sparse to leafy habit. The variety was therefore subjected to pedigree selection, and several pure strains were soon obtained from the original mixture. The object of this breeding programme was to combine the lowest possible prussic acid content with improved agronomic

TABLE 1.

Comparison of Sweet and Common Sudan Grasses.

| —— | Common Sudan (e.g. Roma). | Sweet Sudan. |
|---|---|---|
| Plant Habit .. | Tall, sometimes rather stemmy | Shorter, compact, well stooled, leafy |
| Stems .. .. | Dry and pithy | Juicy and sweet to taste |
| Leaves .. .. | Narrow ; midribs white | Broader ; midribs cloudy |
| Heads .. .. | Very open, with long branches ; seed falls readily after maturity | Smaller and less open, with shorter branches and greater concentration of seed ; seed holds better after maturity |
| Seeds .. .. | Small, elongated, totally enclosed in hulls which may be straw-coloured, blackish, purplish or blotched | Slightly plumper, elongated, totally enclosed in glossy tan glumes which are very distinctive |

Plate 1.

**A View of the Original 3-acre Pure Seed Plot of Sweet Sudan Grass in the Kingaroy District.** This plot was on land which had never previously grown Sudan grass, and was surrounded on three sides by hybrid maize. This crop yielded more than 20 bushels of seed per acre.

characteristics, thus providing a strain more suited to general grazing purposes than the original introduction.

An early selection (identified as SS.6) showed considerable promise, and was placed in special seed increase areas. The resultant seed increase will now be released under the Queensland Department of Agriculture and Stock's Certified Seed scheme, and should be available for commercial planting during 1954.

While it cannot be claimed that this line is a prussic-acid-free variety, tests have shown it to be much lower in cyanide content than the average of the originally introduced material. In this respect it also compares more than favourably with the normal lines of Sudan grass available at present in Queensland.

The satisfactory sugar content should enhance its palatability, while the free stooling habit and leafiness will provide a satisfactory bulk of nutritious fodder.

## Planting Rate.

The amount of seed required per acre should be approximately the same as for common Sudan grass. The larger seed size (and consequently fewer plants per pound) should be balanced by the better stooling habit of the new variety. Satisfactory seeding rates for Sudan grass are 8–10 lb. per acre when drill-sown, and up to 14 or 15 lb. per acre when broadcast.

## Utilisation of the Crop.

Sweet Sudan grass may be used in precisely the same way as common Sudan grass (see Division of Plant Industry Pamphlet No. 139, "Sorghum Growing in Queensland"). It may be planted either on its own or in combination with a legume such as cowpea, and may be grazed under similar conditions to those observed with the grazing of common Sudan grass. The risk of prussic acid poisoning will not exceed that always present with Sudan grass, and should in fact be less than usual. In grazing the crop, however, the customary precautions recommended for the grazing of Sudan grass and other sorghum crops should certainly be taken.

Owing to the limited quantity of seed available until this season, experimental work other than that confined to plant-to-row breeding tests has not been possible. However, the Department has arranged a series of grazing trials for the current season, which should provide valuable comparisons with Roma and common Sudan grass.

Plate 2.

**Mother-seed Plot of Sweet Sudan Grass 19 Days after the Crop had been Harvested by Reaper-and-binder.** Some sheaves are lying on the ground, and regrowth in the rows has reached a height of 6-8 in.

Plate 3.

**Another View of the Mother-seed Plot of Sweet Sudan Grass, Showing Stooks of Sheaves.** This plot was harvested by reaper-and-binder, and the sheaves threshed in a stationary thresher three weeks later.

Some glowing reports on the original American Sweet Sudan grass have appeared from time to time in farming journals. One such report in the American publication "Farm Journal and Farmer's Wife" states that Sweet Sudan grass has been winning new friends in nearly every section of that country. One of the important claims made for the new variety is its superior degree of palatability over ordinary varieties of Sudan grass. Other reports indicate that this variety, mixed with a legume such as cowpea, provides a highly palatable and most nutritious grazing crop for dairy farmers in Illinois and other States.

While such promising reports have yet to be confirmed in Queensland, there is every indication that this new

Plate 4.

**Heads of Sweet (Left) and Roma (Right) Sudan Grass, Showing Differences in Size and Openness.** These heads were old heads, and it is apparent that much more seed has been shed from the Roma head than from the Sweet.

variety will prove a useful addition to the present range of summer grazing crops.

## Future Work.

Pedigree selection is being continued within the original variety, and one leafy, very late-maturing strain has already been isolated. Last year this strain was fresh and green when other lines alongside were already badly fired; to date this newer strain has also proved to be relatively low in prussic acid content. Such promising strains will be thoroughly tested, and if proved superior to the present strain (SS.6), will replace that strain under the seal and label of the Queensland Government Certified Seed scheme.

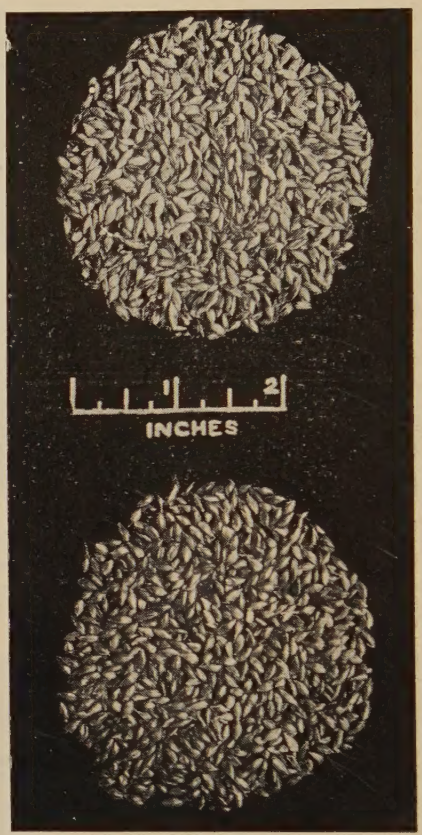


Plate 5.

**Seed Samples of Roma (Top) and Sweet (Bottom) Sudan Grass.** The Roma sample is straw-coloured with occasional blotching, while the Sweet sample is a uniformly glossy tan.

## Index to Vol. 77.

The index to Vol. 77 of the Journal (July-December, 1953) is now being printed and will be available shortly to any who require it. Application should be made to the Under Secretary, Department of Agriculture and Stock, Brisbane.

# Irrigation Practice in Queensland.

## Part 3. Implements Used in Preparing Land.

A. NAGLE, Irrigationist, Agriculture Branch.

In the preparation of land for irrigation, the grading of land may suggest that heavy machinery such as road graders of either the power or drawn type is required. These machines do effective work in big areas but are not readily available, and in addition the hire charges, ranging from £2 10s. per hour upwards, restrict their general use if less expensive machinery is available. Usually some light corrective grading is required after the initial grading and a home-made implement can be used for both operations.

Actually there are a number of implements which can be constructed on the farm and which under suitable conditions do quite effective work. A farmer who has an implement available can do grading and other developmental work at times when routine farm work is slack. In this way he not only avoids the heavy hire charges, but also the rush to complete the work in a specified time, as is the case when heavy grading machinery is hired.

### Land Leveller.

An implement in general use in the irrigation areas of southern States and used to a limited extent in Queensland is the *land leveller or land grader*. This implement has a 4-wheeled rectangular frame of angle steel 12–14 ft. long to which is fitted a transverse blade 6–8 ft. wide (Plate 1.) The blade can be raised or lowered to pick up or drop soil as required or can be set to give an automatic smoothing action. The comparatively long frame allows the machine to bridge small irregularities, thus dropping soil in hollows and biting into high spots as the machine moves over the field.

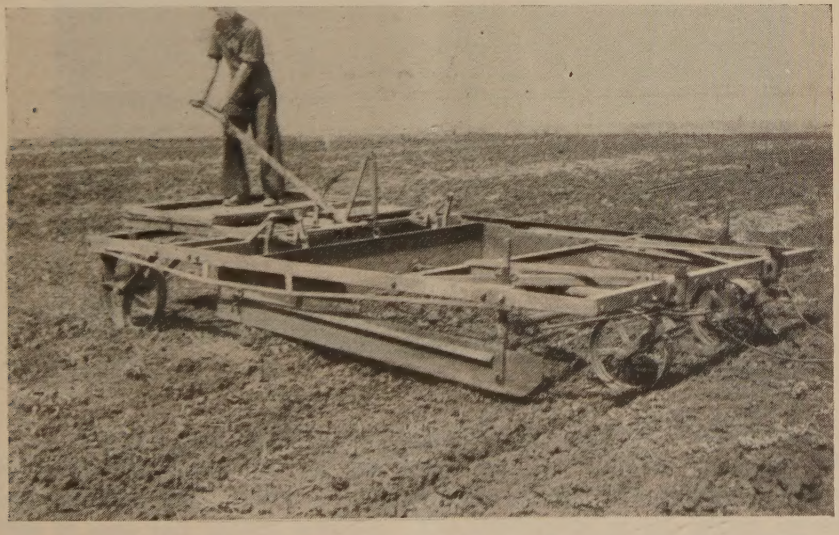

Plate 1.

**Land Leveller Shown Depositing Soil on the Site of a Check Bank.**

This type of implement can also be used as a *crowder* for crowding up the spoil deposited on the check bank sites.

The cost is approximately £150 and would not be high for small groups of farmers who are developing either furrow irrigation or flood irrigation on the border system.

## Scraper Board.

Other useful implements can be manufactured by the local blacksmith or handyman. The first is the *scraper board or grading board.* This is constructed from 2-in. hardwood and is 8 ft. long and 18 in. wide (Plate 2). A cutting edge of ½ in. x 3 in. iron is fitted on the bottom edge and a wooden or pipe handle is fitted at an angle to the top of the board, being securely stayed in position. A rope is attached to the top of the handle to control the board in operation. The pull of the board is by chains attached to eye bolts fitted about 6 in. above the bottom edge, and loops of flat iron (old cart tyres are suitable) are attached so that the implement rides on these loops when travelling empty or in tipping to deposit soil.

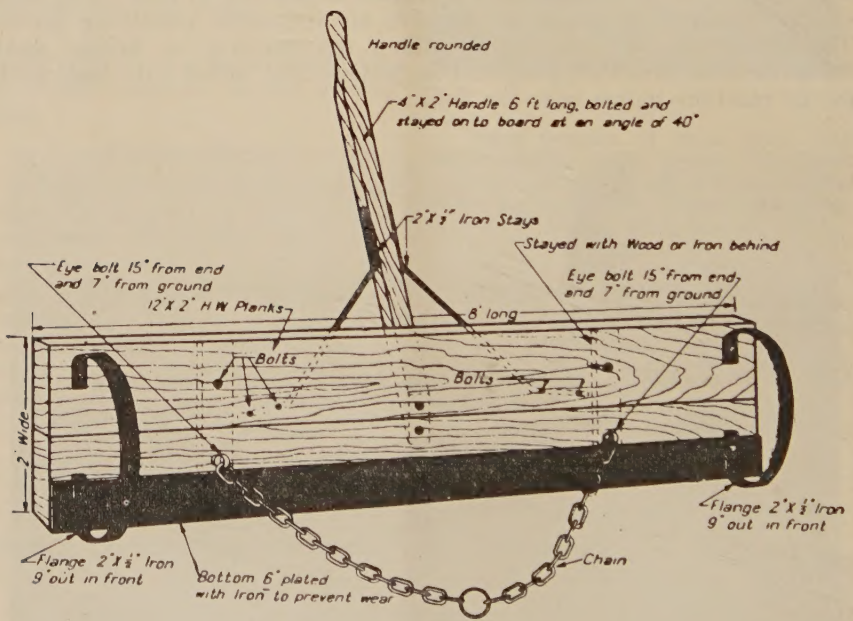
Handle rounded
4"X2" Handle 6 ft long, bolted and stayed on to board at an angle of 40°
2"X½" Iron Stays
Stayed with Wood or Iron behind
Eye bolt 15" from end and 7" from ground
12"X2" H.W. Planks
8' long
Eye bolt 15" from end and 7" from ground
Bolts
Bolts
2' Wide
Flange 2"X½" Iron 9" out in front
Flange 2"X½" Iron 9" out in front
Bottom 6" plated with Iron to prevent wear
Chain

Plate 2.

**Sketch of Scraper Board, Showing Method of Construction.** This sketch is taken from a publication issued by the Victorian State Rivers and Water Supply Commission.

By pulling on the rope the board is brought into an erect or cutting position, the handle being rested on the shoulder of the operator while the board is cutting or carrying earth. By throwing the handle forward the top of the board also inclines forward and the earth is dumped or spread as required. Some experience is needed with this implement, but excellent work can be done after a little practice.

### Johns Leveller.

Another implement which has proved very useful for levelling land is the *Johns leveller*, as described in the publication "The Drainage of Farm Lands" published by Massey Agricultural College, Palmerston North, New Zealand. This implement (Plates 4 and 5) is made of two 12 in. x 3 in. hardwood planks 12–16 ft. long fastened at right angles. The horizontal board acts as a means of control, while the vertical board, to the bottom of which is fastened a steelplate 3 in. x $\frac{1}{2}$ in. for a cutting edge, acts as a grader blade. A handle is attached to the middle of the bottom board, and by raising or lowering the handle the leveller can be made to gather or spread soil as required.

Plate 3.

**Johns Leveller Cross Grading Land.** The soil is being deposited on the site of a check bank.

A chain is attached for pulling the leveller, and with the use of a kidney link the pull on the chain can be adjusted to enable the leveller to be pulled obliquely or angled, angling being used in correction of side fall within borders. The usefulness of the Johns leveller has already been demonstrated on several farms in Queensland, excellent work being performed where the soil is in a dry, fine tilth.

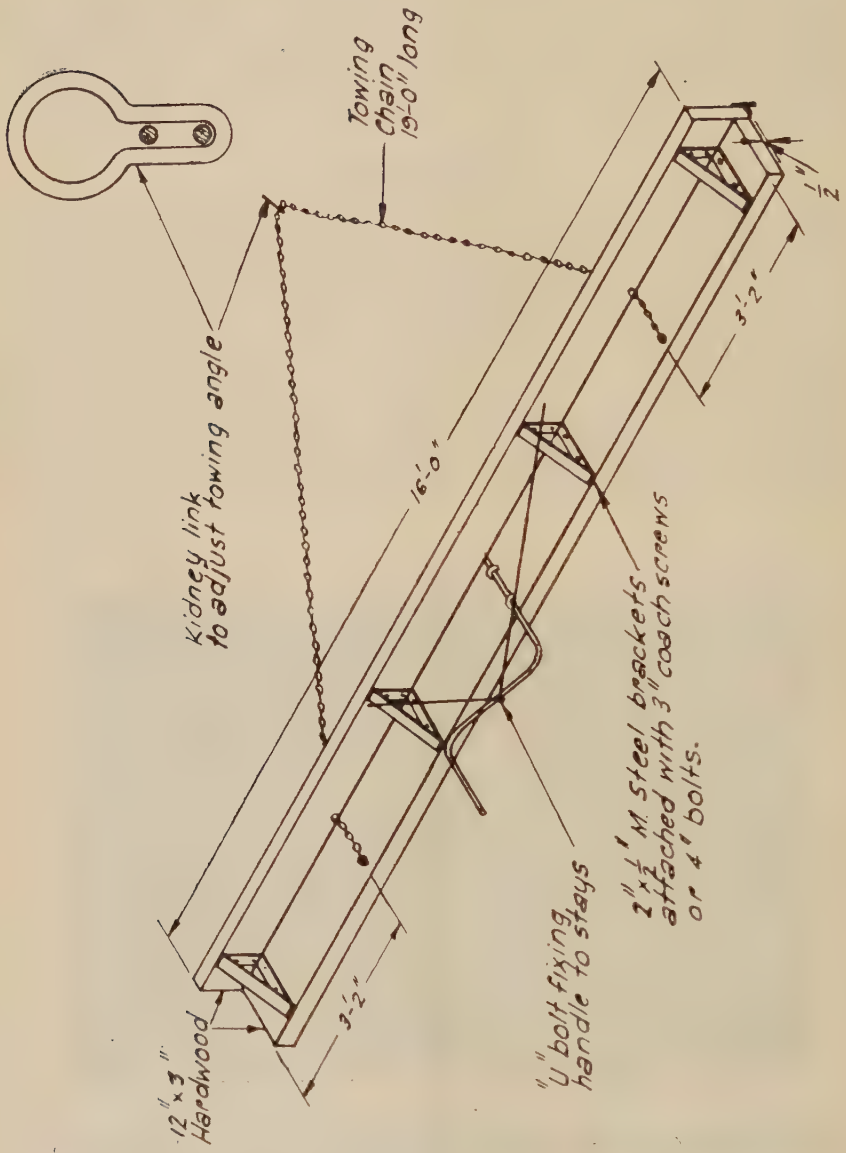
Towing Chain 19-0" long
Kidney link to adjust towing angle
16'-0"
3'-2"
3'-2"
1½"
2" x ½" M. Steel brackets attached with 3" coach screws or 4" bolts.
"U" bolt fixing handle to stays
12" x 3" Hardwood

Plate 4.

**Sketch of Johns Land Leveller, Showing Details of Construction.** The towing hook engages in a link which can be moved to any part of the chain. This enables the leveller to be pulled with its length at right angles to the direction of pull after the manner of a scoop or obliquely to the direction of pull as with a road grader blade. The design is based on one by Mr. J. Johns, of Belfast, New Zealand.

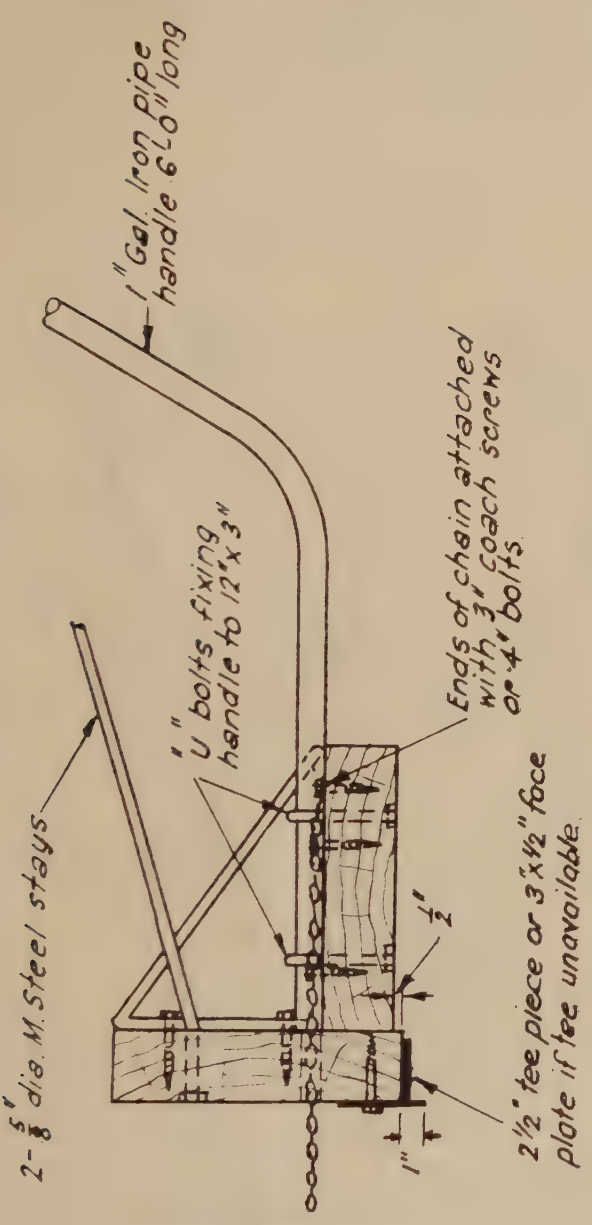
1" Gal. Iron pipe handle 6'0" long
U bolts fixing handle to 12"x 3"
Ends of chain attached with 3" coach screws or 4" bolts
2-⅝" dia. M. Steel stays
2½" tee piece or 3"x½" face plate if tee unavailable
1"
2"

Plate 5.

**End View of Johns Land Leveller.**

## Crowder.

*A crowder* for forming neat and uniformly sloped check banks from the soil dumped on the bank lines can be easily constructed from boards of 12 in. x 2 in. hardwood. Two boards 8–10 ft. long are fixed 7–8 ft. apart at the front end and 2 ft. 6 in. apart at the back (Plate 6).

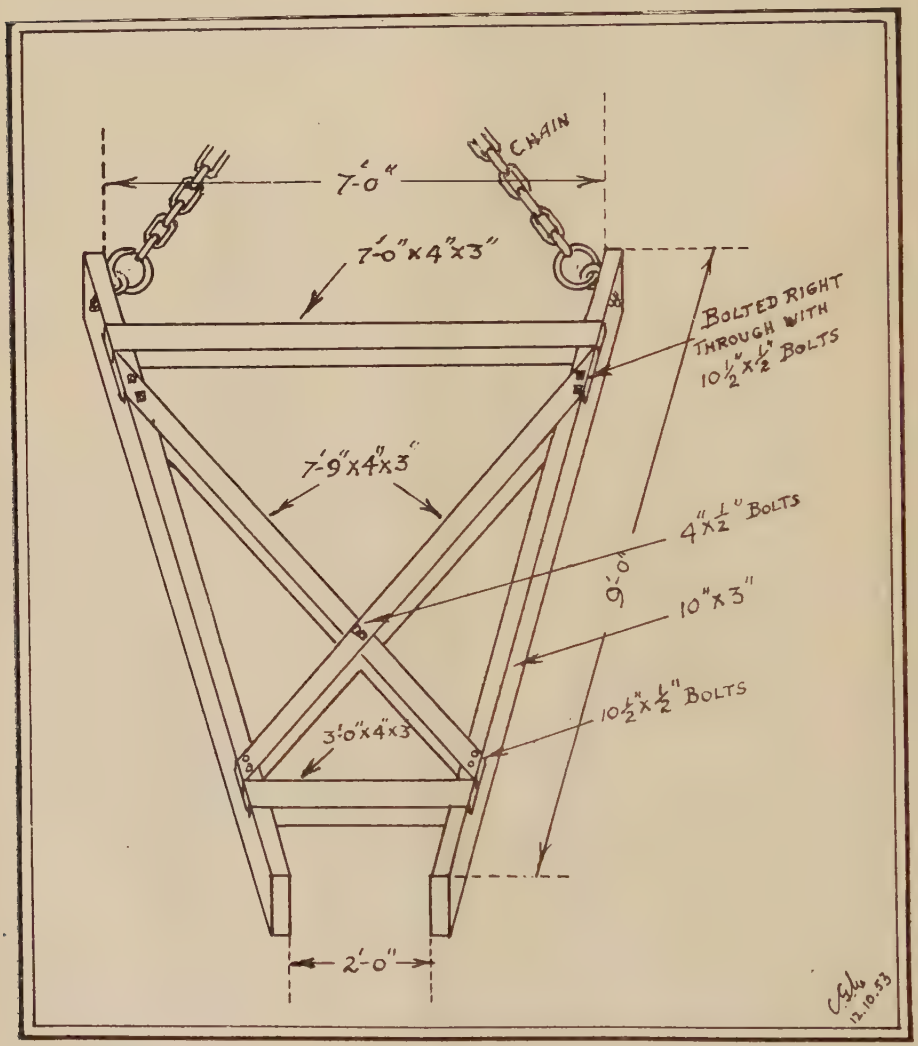


Plate 6.

**Sketch of Crowder, Showing Method of Construction.**

The crowder is drawn from the front end and "crowds" the loose soil into a uniform neat bank.

## Delver.

For construction of head ditches, a wooden implement known as a *delver* can be used. This implement is easily made. It consists of 12 in. x 2 in. or 14 in. x 2 in. hardwood, the long or land piece being 10 ft. long and the short or wing piece, which acts as a grader blade for pushing soil, 4 ft. 6 in. long. This wing piece is hinged and the width can be set as required by an adjustable iron rack. Plate 7 shows details of the construction of the delver.

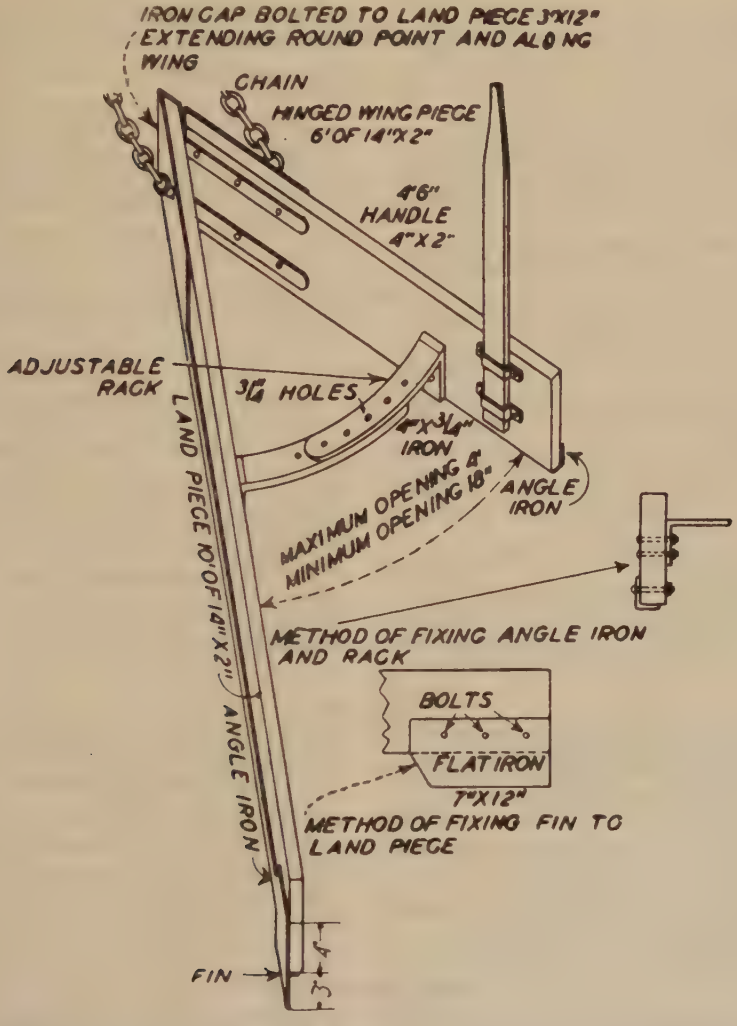


Plate 7.

**Sketch Showing Details of Construction of Home-made Delver Used for Constructing Check Banks.**

# Brucellosis Testing of Swine.

A herd listed by the Department as " brucellosis tested " is one in which all such animals as may be determined by the Director of the Department's Division of Animal Industry have been subjected to two successive tests for brucellosis, at intervals determined by him, without any positive reactors being found.

In order for a herd to be retained on the list of Tested Herds, a semi-annual or annual re-test of the herd, as determined by the Director, is required. If at a re-test any animal gives a positive reaction to the test the herd is removed from the list ; it is not listed again until subsequent tests, as determined by the Director, have been carried out.

## TESTED HERDS (As at 24th March, 1954).

### Berkshire.

J. J. Bailey, " Lucydale " Stud, East Greenmount
S. Cochrane, " Stanroy " Stud, Felton
G. Handley, " Handleigh " Stud, Murphy's Creek
J. L. Handley, " Meadow Vale " Stud, Lockyer
R. G. Koplick, " Melan Terez " Stud, Rochedale
O'Brien and Hickey, " Kildurham " Stud, Jandowae East
E. Pukallus, " Plainby " Stud, Crow's Nest
G. C. Traves, " Wynwood " Stud, Oakey
E. Tumbridge, " Bidwell " Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
M. K. Collins, Underwood Road, Eight Mile Plains
H.M. State Farm, " Palen " Stud, Palen Creek
A. R. Ludwig and Sons, " Cryna " Stud, Beaudesert
H. H. Sellars, " Tabooba " Stud, Beaudesert
D. T. Law, " Rossvill " Stud, Trouts road, Aspley
R. H. Crawley, " Rockthorpe " Stud, *via* Pittsworth
F. R. J. Cook, " Alstonvilla," Wolvi, *via* Gympie
Mrs. I. M. James, " Kenmore " Stud, Cambooya
H. L. Stark, " Florida," Kalbar
J. H. N. Stoodley, " Stoodville," Ormiston
H.M. State Farm, Numinbah
V. G. M. and A. G. Brown, " Bardell," Goovigen
R. E. Paulsen, " Crest " Stud, Binjour Plateau, M.S. 670, Gayndah
M. G. and R. H. Atkins, " Diamond Valley " Stud, Mooloolah
L. Puschmann, " Tayfeld " Stud, Taylor
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
W. F. Ruhle, " Felbar " Stud, Kalbar
C. E. Edwards, " Spring Valley " Stud, Kingaroy
G. J. McLennan, " Murcott " Stud, Willowvale
H. M. Wyatte, " Deepwater " Stud, Rocky Creek, Yarraman
C. F. W. and B. A. Shellback, " Redvilla " Stud, Kingaroy
R. J. Webber, " Webberberry " Stud, 35 Caxton st., Petrie Terrace
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert

### Large White.

H. J. Franks and Sons, " Delvue " Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, " Highfields," Murgon
K. B. Jones, " Cefn " Stud, Pilton
R. G. Koplick " Melan Terez " Stud, Rochedale
R. Postle, " Yarralla " Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood
E. J. Bell, " Dorne " Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood
H. R. Gibson, " Thistleton " Stud, Maleny
H.M. State Farm, Numinbah
K. A. Hancock, " Laurestonvale " Stud, Murgon
V. P. McGoldrick, " Fairymeadow " Stud, Cooroy
S. T. Fowler, " Kenstan " Stud, Pittsworth
H. L. Larsen, " Oakway," Kingaroy
C. Allison, " Colrene " Stud, Lake and Reserve roads, Slacks Creek
Mrs. I. G. Utting, " White Lodge," Mountain road, Cooroy
N. E. Meyers, Halpine Plantation, Kallangur
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
G. I. Skyring, " Bellwood " Stud, *via* Pomona
O. J. Horton, " Manneum Brae " Stud, Manneum, Kingaroy
M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley
Miss G. R. Charity, Coondoo, Kin Kin.
W. J. Blakeney, "Talgai" Stud, Clifton
F. K. Wright, Narangba, N. C. Line

### Tamworth.

S. Kanowski, " Miecho " Stud, Pinelands
N. R. Potter, " Actonvale " Stud, Wellcamp
D. F. L. Skerman, " Waverley " Stud, Kaimkillenbun
A. C. Fletcher, " Myola " Stud, Jimbour
Salvation Army Home for Boys, " Canaan " Stud, Riverview
A. J. Surman, " Namrus " Stud, Noble road, Goodna
Department of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, " Sunny View," M.S. 90, Kingaroy
F. N. Hales, Kerry Road, Beaudesert
T. A. Stephen, " Withcott," Helidon
W. F. Kajewski, " Glenroy " Stud, Glencoe
A. A. Herbst, " Hillbanside " Stud, Bahr Scrub *via* Beenleigh
R. G. Koplick, " Melan Terez " Stud, Rochedale
H.M. State Farm, Numinbah
D. B. Alexander, " Debreczen " Stud, Kinleymore *via* Murgon
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley
G. H. Sattler, Landsborough
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
P. V. Campbell, " Lawn Hill " Stud, Lamington

### Wessex Saddleback.

W. S. Douglas, " Greylight " Stud, Goombungee
D. Kay and P. Hunting, " Kazan " Stud, Goodna
J. Gleeson, " Iona Vale " Stud, Kuraby
C. R. Smith, " Belton Park " Stud, Nara
H. H. Sellars, " Tabooba " Stud, Beaudesert
H. Thomas, " Eurara " Stud, Beaudesert
D. T. Law, " Rossvill " Stud, Trout road, Aspley
J. B. Dunlop, " Kurrawyn " Stud, Acacia road, Kuraby
A. Curd, " Kilrock " Stud, Box 35, Jandowae
F. K. Wright, Narangba, N. C. Line
C. Allison, " Colrene " Stud, Lake and Reserve roads, Slacks Creek
R. A. Collings, " Rutholme " Stud, Waterford
M. Nielsen, " Cressbrook " Stud, Goomburra
G. J. Cooper, " Cedar Glen " Stud, Yarraman
M. E. Bryant, " Maryland Brae " Stud, Blunder road, Oxley
A. H. Groves, " Kinvara " Stud, Ingleside, West Burleigh
J. E. Heath, "Springlea" Stud, Murgon
Mrs. R. A. Melville, "Wattledale Stud," Beenleigh road, Sunnybank

# Agricultural Chemistry

## Use Sawdust With Care!

F. CHIPPENDALE, Senior Soils Technologist.

Many thousands of tons of sawdust go to waste each year in Queensland. To help put some of it to use, various individuals and authorities have recommended it as a valuable mulch, particularly for such crops as ginger.

Sawdust contains little in the way of major plant foods and even these become available very slowly, but it is extremely useful as a mulch to keep down weed growth, conserve moisture and soil, and provide shade, thereby ensuring cooler temperatures for surface roots.

There are occasionally disastrous results from the use of sawdust on farm lands for one or more of the following reasons:—

(1) Nitrogen starvation of plants.

(2) Natural poisons in sawdust.

(3) Poisons introduced to timber by millers.

### Nitrogen Starvation.

The most frequent and one of the most dramatic results of the addition of sawdust to the soil is when a great bulk of it is incorporated with the soil.

The sudden large supply of substances such as cellulose provides a ready source of energy for the microbial population of the soil. These micro-organisms immediately tie up the small supply of soil nitrogen (there is virtually no nitrogen in the sawdust) and so there is little or no nitrogen left for plants.

This phenomenon is frequently seen in the field when sawdust is turned in following a crop of ginger and the next crop planted soon after.

The effect can best be counteracted by large applications of nitrogenous fertilizer—up to 10 cwt. of sulphate of ammonia per acre has been used in the Eumundi district. Alternatives are to rake off the sawdust so that it can be returned as a mulch after the planting of the next crop, and to allow a long period of fallow before the succeeding crop is planted following the turning in of sawdust.

### Natural Poisons.

Natural poisons which can cause trouble are essential oils and a very high lignin content which can adversely affect growth. Together with more obscure growth inhibitors, these substances affect only certain plants. For crops such as ginger, pineapples, bananas, orchard trees, strawberries and lettuce, they appear to be of no importance in the case of timbers normally put through Queensland sawmills.

The higher lignin content of hardwood sawdust causes its decomposition to be retarded compared with that from softwood. Many farmers, however, prefer the hardwood despite this disadvantage, for in areas where white ants occur the use of pine or similar sawdust causes such an increase in the termite population that the insects frequently turn to the growing plants in search of additional food.

### Introduced Poisons.

Poisons are introduced into timber to prevent the deterioration of logs prior to sawing, or to protect sawn timber from mould or insect attack. Borax and boracic acid baths are the commonest timber treatments used in Queensland at present. These substances are excellent weedicides when used in concentrated form, and when this concentration is approached many cultivated plants are killed off.

As sawdust and shavings often contain a high proportion of surface timber—the treated portion—it is not difficult to understand that adding 15 to 45 tons of sawdust per acre may inadvertently add enough boron to cause the death of the very plants whose growth it was intended to improve. It is possible to introduce up to 500 lb. of borax per acre in this manner, whereas 10–20 lb. of borax per acre is a normal treatment when soils are known to be deficient in boron. Boron being a micro-nutrient is required by all plants in small quantities, but potatoes, beans and tobacco have been injured by as little as 10 lb. of borax per acre.

Pentachlorphenates and related substances used for timber treatment have also been known to have ill effects on plants when added along with sawdust, but they are of minor importance when compared with boron compounds. Distortion of young growth is usually the first sign of trouble from these chemicals.

The precaution should be taken of obtaining an assurance from the supplier that the timber put through his mill has not been treated against fungi or insects with any chemicals. Heavy sawdust applications must be avoided if there is any doubt about the use of such substances.

Remedial measures can be taken in the case of boron compounds. The most effective is to add an excess of agricultural limestone, say two tons per acre, as soon as it is realised that too much boron has been added. The first hint of the trouble may be the severe burning of leaf margins—particularly the tip portion—but this sign is not a sure indication that boron is causing the trouble, as any soluble injurious salts may give rise to such leaf scorch. The lime treatment should only be applied once the presence of excess boron has been confirmed by enquiries made from the supplier.

If the application has been a very heavy one, it may be too late to save the crop once leaf symptoms have appeared.

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# PLANT PROTECTION

## The Blue Oat Mite.

A. W. S. MAY, Senior Entomologist.

The blue oat mite (*Penthaleus major* (Duges)), or as it is sometimes called, the pea mite, a major pest of pastures and various annual crops in southern States, seldom attains pest status in Queensland. Occasionally, however, it may cause damage to wheat, oats and barley crops on the Darling Downs and to peanut crops in the Kingaroy district. Economic losses are invariably associated with attacks on seedling stands.

### Damage to Cereals.

Damage in these crops usually occurs in late plantings that germinate and commence growth under dry, cold conditions. Lack of moisture in the upper soil and continued low temperatures retard development of the main root system and thus prevent the seedling plant outgrowing mite injury.

The mites feeding on the leaves cause silvery or greyish areas, and when feeding is intense the entire leaf presents a bleached appearance. In extreme instances, older leaves or even the entire plant may be killed. Early gross symptoms of mite activity take the form of paler green to greyish irregular patches within the field and these may be mistaken for frost injury. As temperatures rise the mites spread rapidly; damaged areas enlarge and merge. Infested crops then present an overall greyish appearance and make little growth. Despite a return to good growing conditions, badly damaged crops remain stunted and produce little worthwhile grain.

### Damage to Peanuts.

When inadequate rainfall checks plant growth soon after germination mites may be troublesome. Their activity is first noticed as a general yellowing of the leaves and a more obvious slackening in crop development. Lower leaves are shed, and if mites are numerous some plants may be killed.

### Appearance, Life History, and Habits.

Adult mites are oval in shape and measure approximately 1-30th of an inch in length. The body is purplish blue in colour except for an oval reddish spot on the upper surface. The legs and mouthparts are bright red. Eggs are laid singly or in groups of three or four on the leaves, in the soil or amongst rubbish at the base of the plants; they vary in colour from orange to whitish-yellow.

Plate 1.
**The Blue Oat Mite.**

Immature mites are very similar to the adults in appearance though much smaller in size. Activity is greatest during winter and spring, and eggs hatch as soon as cold weather commences after favourable late autumn rains. Subsequent breeding, which is accelerated by dry, cold conditions, is also dependent to a large extent on the weather.

### Control.

Mite infestations can be checked rapidly and effectively with DDT applied, either as spray or dust, at the rate of ¼ lb. of active ingredient per acre. This means that one gallon of 25% DDT concentrate, or 125 lb. of 2% dust, suitably diluted, is sufficient to treat completely 10 acres of crop.

When mites are confined to isolated patches, early treatment of these and surrounding narrow borders will localise the infestations, and consequently reduce overall control costs.


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**The sample submitted should be representative of the bulk and a covering letter should be sent advising despatch of the sample.**

**MARK YOUR SAMPLE**

Sample of ..... seed
Drawn from ..... bags
Representing a total of .....
Purchased from .....
Name and Address of Sender
Date.....

**SIZE OF SAMPLE**

| | | | |
|---|---|---|---|
| Barley | 8 oz. | Oats | 8 oz. |
| Beans | 8 oz. | Peas | 8 oz. |
| Grasses | 2 oz. | Sorghum | 4 oz |
| Lucerne | 4 oz. | Sudan | 4 oz. |
| Millets | 4 oz. | Wheat | 8 oz. |

Vegetable Seeds - ½ oz.

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# The Honey Flora of South-eastern Queensland.

S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture).

(*Continued from page 159 of the March issue.*)

## Spotted Gum.

*Botanical Name.—Eucalyptus maculata* Hook.

*Distinguishing Features.*—A tree with pinkish to greyish bark, smooth except for numerous dimples in which pieces of old bark may remain attached for some time so that the trunk has a spotted appearance. The leaves are scattered along the twigs, the flowers are arranged in bunches near the ends of the twigs with short blunt lids and the capsule is rather large and woody (Plates 73–75).

*Description.*—This is a tree up to 120 ft. high or more with a fairly compact dark green crown. The bark is pinkish, whitish or greyish, smooth except for numerous small hollows in which pieces of last season's bark remain attached for a long time ; this gives the trunk a spotted appearance, and suggested the common name. The leaves are scattered along the twigs, somewhat dark or dull green, several times longer than wide, usually 3–6 in. long. The flowers are borne in bunches at and near the ends of the twigs and are nearly 1 in. wide when fully out ; the lid is rounded or shortly pointed and much shorter than the rest of the bud. The seed-capsule is shaped something like an egg with the top cut off ; it is thick and woody, from more than $\frac{1}{2}$ in. to about $\frac{3}{4}$ in. long.

*Distribution.*—Spotted gum is fairly common in south-eastern Queensland on stony ridges in forest country, often growing with one of the ironbarks. It also occurs in New South Wales. In the northern part of the Wide Bay and Burnett Districts, spotted gum is replaced by the closely similar lemon-scented gum (*Eucalyptus citriodora* Hook.), while further study may show that the spotted gum of the western part of the Darling Downs is also different.

*Usual Flowering Time.*—June–September.

*Colour of Honey.*—Medium amber.

*Importance as Source of Honey.*—Minor.

*Importance as Source of Pollen.*—Medium.

Plate 73.

**Spotted Gum (Eucalyptus maculata).** Leaves, buds and flowers.

Plate 74.
**Spotted Gum (Eucalyptus maculata).** Portion of trunk.

Plate 75.
**Spotted Gum (Eucalyptus maculata).** Daisy Hill.

*General Remarks.*—Spotted gum yields a honey flow once in three or four years and in most other years "stores" only are produced. This species flowers early in the season and produces good quality pollen valuable for building up colonies in preparation for spring and summer honey flows. For this reason spotted gum locations are favoured by some coastal beekeepers. Care should be exercised, however, in assessing the flowering time of this species, as buds may hang from 12 to 15 months before breaking.

This honey, to a greater extent than most other honeys, froths when heated, and as a result requires a longer time to settle before marketing. It has fair flavour and density and granulates slowly with a coarse, brown grain.

[TO BE CONTINUED.]

## List of Pest Birds and Mammals.

The birds and mammals in the following list are declared pest fauna and may be destroyed at any time of the year throughout the State with the following restrictions:—

(*a*) Pest fauna may be taken within a sanctuary only by holders of land within the sanctuary and their authorised agents.

(*b*) Bee-eaters are pest fauna only within the Brisbane and East Moreton Pest Destruction Board areas.

(*c*) Flying foxes are pest fauna only within the Brisbane and East Moreton and Toowoomba Pest Destruction Board areas.

### Pest Birds.

Wedge tailed eagle
Grey (white) goshawk
Australian goshawk
Collared sparrow-hawk
Cormorants (shags)
Eastern swamphen (bald coot)
Falcons except the nankeen kestrel
White cockatoo
Silvereyes
Crows and ravens
Pied currawong
Grey butcher bird
Sparrow
Starling
Turtle dove
Rose-breasted cockatoo (galah)
Bee-eaters (see note above)

### Pest Mammals.

Dingoes
Rabbits
Foxes
Hares
Flying foxes (see note above)

# ANIMAL HEALTH

## The Use of the Newer Insecticides in the Control of Cattle Tick.

PREPARED BY OFFICERS OF THE ANIMAL HEALTH STATION, YEERONGPILLY.


### SUMMARY.

DDT is used in dipping vats and spraying fluids. Its effect on the tick is a little irregular and some ticks may escape destruction. It has remained stable in dipping vats up to five years and the organic matter that accumulates in the vat does not affect it. The most suitable level to use is about 0.5%. Though DDT destroys ticks rather slowly, its residual effect is high. It is not toxic to cattle but should not be mixed with arsenical dipping fluid. There is no indication that ticks become tolerant to DDT.

BHC is available in a suitable form for dipping and spraying purposes. It also is a little uncertain in its effects. It has remained stable in vats up to five years. A strength of 0.05% is recommended, though lower levels may be quite effective. Its residual effect is a little below that of DDT. BHC can be toxic to cattle, the emulsion form apparently being the more poisonous. There is some evidence that ticks may become resistant to BHC.

Toxaphene in both spraying and dipping fluids appears to be a little more certain in its effects than DDT or BHC. It has remained stable in dipping vats for three years. The recommended level is 0.5%. It kills ticks very quickly and has a fairly high residual effect. Calves under three months may be poisoned. There is little evidence yet on resistance of ticks to toxaphene.

Chlordane (0.25%) and dieldrin (0.05%) have both been tested as spraying fluids in dairy herds for five and three years respectively with satisfactory results. Neither is yet registered in Queensland for use as a cattle dip. Both kill ticks fairly rapidly and the residual effect of each is fairly high. There is no evidence of toxicity to cattle.

Menthachlor, heptachlor, E605 (parathion) and aldrin have been found suitable for tick control in the laboratory but have not been used in the field.

In normal years in south-eastern Queensland about 6-8 treatments are needed to control ticks, treatment to begin about October and finish about April. Treatments should be 30-35 days apart. In Central and North Queensland, year-round treatment is often necessary.

Once ticks have been brought under reasonable control, treatments should be discontinued. If the ticks are eliminated completely from the property by continued treatment, the cattle may lose their immunity to tick fever, with disastrous results.

The tick is now developing a resistance to some insecticides besides arsenic.

## INTRODUCTION.

It is over 50 years since arsenic was first tried in central Queensland for the control of cattle tick, and because of the good results obtained it was introduced soon afterwards into Natal, South Africa. Subsequently its use spread to other parts of the tropical world where ticks were troublesome to cattle, and it soon became the standard method of treatment. It has been employed successfully in eradication campaigns, the most noted example being the freeing from cattle tick of large areas of the U.S.A. some 40 years ago, while it has also been employed in New South Wales to free certain infested districts along the southern fringe of the tick zone of eastern Australia.

For over 40 years it had been used in Queensland to control ticks on beef cattle and on dairy farms with satisfactory results. At the end of that time—about 10 years ago—reports were received that the parasite was becoming more difficult to control, and it seemed as if a resistance to arsenic was being acquired. Enquiry and the necessary testing of ticks showed that these reports were true. About the same time, overseas workers made similar observations, and it is now well known that arsenic-resistant ticks are to be found in many of the tropical areas of the world. Certainly ticks highly resistant to arsenic exist in various parts of Australia.

## THE NEWER INSECTICIDES.

Some 15 years ago, DDT, which had been prepared many years previously but had never been tested for its properties as a possible pesticide (qualities not suspected from its formula), was applied to certain vegetable parasites and found to be highly effective. Its use then spread to other fields, and some years ago the first samples were obtained for testing against cattle tick. At the present time it is available on the market for cattle tick control in the familiar form of a paste containing 50% DDT, which has to be heated before dilution with water to the required working concentration. This need for heating is a disadvantage, especially as overheating can be damaging and heating is time-consuming as well. Moreover, the paste does not mix with hard waters.

Benzene hexachloride (BHC) was introduced later than DDT. It also is available on the market as a 50% paste, but it requires no heating before adding to water and can be mixed with hard waters.

Toxaphene can now be obtained as a heavy liquid concentrate containing 65% of the active principle. It has only recently been made available to stockowners.

Chlordane is not available for cattle tick control purposes. But it has been tested under laboratory conditions, and has been applied in the field in trials for some five years.

Dieldrin has been tried the same way and has been used in the field for three years.

A number of other insecticides have been used under laboratory conditions only. They include aldrin, heptachlor, menthachlor, TTC and E605 (or parathion), an organic phosphate.

## RESULTS OBTAINED FROM TRIALS.

### A. Laboratory Trials using Spraying Fluids.

In these we have used artificially infested animals. Cattle are tick-free when taken in hand. They are run under paddock conditions, and three times weekly several thousand larvae are applied to each of them. As soon as the first ticks complete the life cycle—about 21–22 days after the first larvae are applied—and begin to drop off as engorged females, the animal is removed from the paddock and placed in a small yard with a concrete floor and treatment applied. Daily surveillance is maintained, all females reaching engorgement collected, and the animal not released until clean.

Many of the animals were grossly infested and suffering from acute tick worry when treated.

1. DDT. The 50% paste available on the market has been extensively tested as a spraying fluid at various levels between 0.25% and 1%. It has been found to be a little uncertain in its action, for whereas an excellent kill of parasites in all stages of parasitic life may be obtained at times—though not always—with concentrations as low as 0.25%, applications at the higher levels of between 0.75% and 1% cannot always be relied upon to kill all ticks.

In heavily infested cattle the engorged female adults may continue to drop off, often in large numbers, for several days after treatment. A large percentage of these may appear to be quite robust and active in every way, and this no doubt has led to the belief that ticks in the last few days of parasitic life are but little affected by DDT. Subsequent observations, at least at levels above 0.5%, will show that very few of these parasites produce viable eggs. DDT is undoubtedly slow in its action, and this quality may lead to the erroneous belief that it may be ineffective.

2. BHC. The 50% paste now obtainable on the market has been tried at levels of between 0.015% and 0.065% gamma isomer (the paste consists of a mixture of what are known to the chemist as isomers, the gamma being the effective one). Like DDT it is a little uncertain in its action, though not quite to the same extent. At the lower concentrations a good kill can often be obtained—though not, by any means, always—while occasionally the higher levels failed to destroy all ticks on some of our experimental animals.

Unlike DDT, BHC kills the female adult very quickly, such adults being visibly affected within a few hours of spraying.

3. Toxaphene. This product had been prepared for us for our laboratory trials some years before its appearance on the market. It has been tested at various levels between 0.15% and 0.6%. It has been found that concentrations of 0.4% and above can usually be relied on to give a kill of nearly all ticks, though lower levels will often give a relatively good kill of parasites.

4. Chlordane. This has been tested at levels up to 0.25%. At this last-mentioned concentration one can expect a kill under normal circumstances of all ticks.

5. Dieldrin. This preparation has been tried at various levels between 0.02% and 0.1%. Above 0.05% it can be relied on to kill nearly all ticks, though at lower levels the percentage of ticks killed is often high. Ticks in all stages are usually visibly affected within a few hours of treatment.

6. Miscellaneous. All other insecticides mentioned previously have been found effective in controlling ticks when used at appropriate levels. The laboratory trials have, however, been very limited.

## B. Field Trials using Naturally Infested Animals.

No field trials using DDT and BHC as spraying fluids have been attempted. From what we know of these preparations from our laboratory trials with sprays, however, both should be satisfactory in giving adequate control. Both are widely used by farmers in sprays in the dairying districts of the State.

Toxaphene has been used for the last five years in a herd of dairy cows just south of Brisbane. This herd is made up of some 100 grade cows, and supplies milk to the city of Brisbane. It has been found that under the climatic conditions prevailing—which are about the average for south-eastern Queensland—six to eight treatments per year are required to keep ticks in control. The toxaphene was used at 0.5%. In an average year treatment is not necessary after the cooler months before October, and if

repeated from then on until about April to May at every 30–35 days, ticks are kept at levels which make them practically harmless. If there are good spring and early summer rains, tick populations may build up to pest levels before October, especially if the weather is warm. On the other hand, the extension of dry cold weather into October or even later may prevent the parasites from appearing in appreciable numbers before December. Similarly, late summer rains and an extension of warm weather into the early winter months may keep the tick population at a high level until June or even later.

Chlordane has been used on a neighbouring herd at 0.25% over the same period (5 years), and has given almost parallel results.

Dieldrin has been used in a dairy herd of some 40 cows in the Brisbane Valley at a strength of 0.05% for the last three years, and has given results about in line with those obtained with chlordane and toxaphene.

## C. Field Trials with Dipping Fluids.

While the object of laboratory and field trials with spraying fluids is to determine the concentration at which a preparation has to be used to obtain adequate tick control, and at the same time ascertain whether the insecticide is likely to be toxic to the host animal, trials with dipping fluids are mainly concerned with resolving the problem as to whether at appropriate levels the concentrate will remain stable and effective, over months and perhaps years, and at the same time does not precipitate out on to the bottom or sides of the vat. Dipping vats very soon, under our conditions, become charged with large quantities of organic matter washed from the bodies of the animals dipped.

The stability and efficiency of a dipping vat can be determined in three ways—

(1) Chemical analysis.

(2) Biological tests in the laboratory.

(3) Observing the effects in the field on treated cattle.

The first method is the ideal, and is used with dipping vats charged with arsenic. With DDT and BHC dipping vats results, however, have not been always satisfactory, and samples collected at the same time, and which should be comparable, may show varying contents of the active principle. These varying results may be set down to difficulties in obtaining true and representative samples.

The third method is the one usually adopted by stockowners, and so long as reasonably good control of ticks is being obtained, results are usually regarded as satisfactory.

The biological test, which consists of spraying a sample of the dipping fluid under test on to an animal carrying a heavy load of ticks in all stages of parasitic life at the laboratory, is a rough and ready method, and obviously very laborious and time-consuming. However, in our hands it has yielded quite useful results, and has been found worthwhile.

Unfortunately, observations with dipping vats have been limited though the information obtained has been of some use.

Two dipping vats, one at Oonoonba (Townsville) and the other at Yeerongpilly, were charged with 0.25% DDT some five years ago and records kept of cattle dipped, water and concentrate added, &c. Periodically, biological tests have been applied to these dipping fluids, and results have shown that their efficiency has been retained.

Observations have also been made on two other dipping vats charged with DDT at points where cattle take their final treatment before moving out of ticky into clean districts—Wandoan and Helidon. These vats are both charged with and topped up with sufficient water and DDT to give them a working level of about 0.6% DDT. Practically no loss of efficiency

has been noted by biological tests, although chemical analyses have been discordant enough at times. Details* of the Wandoan vat are interesting. It holds approximately 3.5 thousand gallons of fluid, and was charged for the first time with DDT in December, 1947, with 392 lb. (seven 56 lb. drums) of 50% DDT paste. Five years later (December, 1952) the vat was emptied for repairs to be carried out. Over this period for topping up purposes there were added more than 12 tons of DDT paste and 210,000 gallons of water, while approximately 175,000 cattle were dipped. Physically, the fluid was reduced long before the vat was emptied to a condition of liquid mud, yet throughout the lethal qualities were retained at a high level, and compared very favourably with freshly prepared DDT at the same strength (0.6%).

One dipping vat near Brisbane charged with BHC has been under control and biological test for nearly six years. This vat, which is owned by a dairy farmer, is used only for his own dairy herd and a few cattle belonging to neighbours. It was built in 1948, and then filled with BHC at half the recommended strength for tick control (that is, approximately 0.03% gamma isomer). Prior to constructing the vat the owner had great difficulty in controlling ticks with arsenic, due no doubt to the presence of arsenic-resistant parasites on the property.

No trouble has been experienced on this property in controlling ticks with this half-strength BHC vat, and biological tests have indicated that there has been no degradation of the active principle, nor has it settled on the bottom or sides of the vat.

Two toxaphene vats have been operating in the field for nearly two years, one in south-eastern, the other in central Queensland. It is too early yet to draw conclusions as to the stability of toxaphene under Queensland field conditions, but both seem to be operating satisfactorily. One other vat charged with 0.5% toxaphene for three years and located in the Brisbane Valley has, unfortunately, had little use.

Altogether the observations so far made with spraying and dipping fluids are too limited to draw any wide and comprehensive conclusions, but they form a satisfactory basis for future planning.

[TO BE CONTINUED.]

* We are indebted to Mr. J. J. Shelvey, Stock Inspector at Wandoan, for these figures.

## BRIGALOW DESTRUCTION.

Experimental work on the destruction of brigalow by aerial spraying with hormone plant-killers was advanced a step further in March when an autumn spraying over 640 acres was completed in the Wandoan, Condamine and The Gums districts.

Further sprayings are planned, and it is hoped within the next couple of years to be able to prescribe with confidence a treatment for a particular type of brigalow at a particular time of the year.

The experiments are concerned with the most effective formula to use, the most economical rate of application, and the most favourable period of the year at which to spray.

The experiments are being supervised by Mr. S. L. Everist, of the Department's botanical staff.

# Cattle Husbandry Practices in the Central Highlands.

J. J. SULLIVAN, Cattle Husbandry Branch.

In recent articles in this journal the writer has described the cattle country of the Central Highlands and dealt in a general way with the breeds of cattle and the make-up of herds. In this article cattle husbandry practices and the marketing of stock are dealt with.

## PROPERTY MANAGEMENT.

When fully staffed, a property with a mixed herd of about 10,000 cattle would employ 10–12 men on managerial and stock work, comprising the manager, book-keeper, head stockman, stockmen, station hands, and perhaps camp bosses and jackeroos. There would also be a station mechanic, cooks (two and sometimes three messes are run at the head station), camp cooks for the musterers' camps, and cowboy-gardener. At least one domestic is usually employed at the head station. There are several out-stations or boundary riders' huts on such properties. The stockmen once spent their time between the head station and the different out-stations or mustering camps as the case may be, but now these are generally vacant.

In addition to this permanent staff there is generally a number of casual employees doing special jobs such as fencing, yard building, horse-breaking and spaying.

On smaller properties the staff would be correspondingly smaller. On properties running 1,000–5,000 head of cattle the management is usually in the hands of the owner, who is generally one of a family group, with one, two or more employees according to the size of the unit. There is no doubt that this is the most efficiently managed type of property unit in the district. In comparison with the large properties (that is, those carrying 6,000–12,000 cattle), there is a greater carrying per square mile and higher turn-off ratio of younger bullocks. The herd wastage is less than on the large holdings, to some extent due to better tick control. There is also the big factor that absentee ownership is avoided. Such ownership is in the main an undesirable state of affairs in any district.

Transport and communication are very important in the management of beef-cattle properties. In this regard the Inland Defence Road constructed during the war from the south, through Emerald and Clermont to Charters Towers and beyond, has proved a boon as an arterial highway. Subsidiary roads to outlying cattle stations have resulted in a vastly improved system of communication over a large area. All stations are now served by truck-mailmen, who pass at least once and often twice a week.

Very few homesteads are now without a telephone and of those few which are still in the comparatively isolated sections some have radio-telephones.

## HERD MANAGEMENT.

The general management of the herd and handling of the cattle vary according to whether the property runs a mixed breeding herd or "dry" cattle, also whether the property is in a clean, marginal or ticky area.

The tick-infested country extends along the blacksoil plains towards the Suttor River. Severe tick infestation also occurs in parts of the Mistake Creek country on the western slopes of the Drummond Range, and on odd pockets of blacksoil country on the north-western boundary.

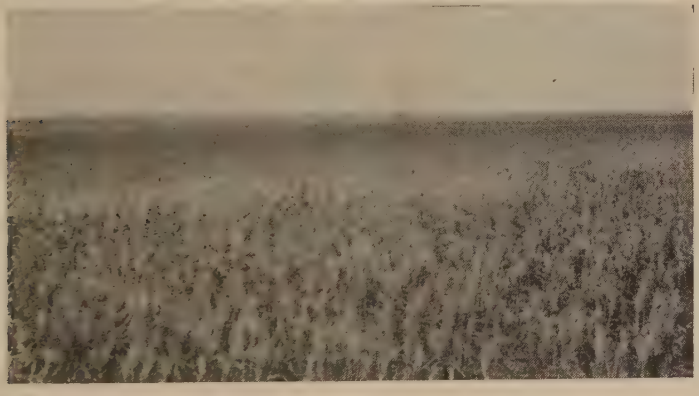


Plate 1.

**A Crop of Grain Sorghum in the Central District.**

In the marginal country, ticks advance and recede according to the season and to stock movements. On a number of properties in the marginal area some paddocks are ticky and some are clean; on some properties ticks appear only in the wet season and on others only after a heavy and prolonged wet season. Thus the situation is somewhat confused. Dangerous outbreaks of tick fever are an annual occurrence in this section and sometimes these outbreaks are followed by heavy mortalities.

### Breeding Properties.

In the mixed herd, where breeding and fattening is carried out, cattle are usually handled in the following way.

The largest herd unit is the "breeders mob," which includes the whole of the female portion of the herd and the bulls as well as the male progeny up to the time of weaning.

Properties carrying up to 1,000 or 1,500 head of cattle usually have one large paddock, probably one-third to half the total area, for running this mob, and if the country is mixed the least valuable country from a grazing point of view is allotted to the breeders.

The best grazing country on the property is made into the bullock paddock and according as the particular property is subdivided the intermediate country is allotted to the steers and to the spayed cows.

As a general rule the herd is run in this manner:—

*In the breeder paddock.*—The breeders, the bulls and the calves at foot and the younger females. There is no hard and fast line of demarcation between the two female units, the heifers constantly stepping up and becoming breeders.

*In the steer paddock.*—The young males from the time they are weaned until they are considered to be eligible for the bullock paddock.

*In the bullock paddock.*—The male portion of the herd from the time they leave the steer paddock until they are turned off as fats.

*In the (spayed) cow paddock.*—The cows which have been culled from the herd and spayed and are being fattened to turn off.

Among those who are adopting more efficient cattle husbandry methods, there is the recognition of the weaners as a separate herd unit and the property has been or is being subdivided to treat them as such. Some provision is being made for separating the weaners according to sex, so that on some properties there is in addition to the paddocks listed a weaner paddock and perhaps a heifer paddock.

**Mating.**

As has been stated, on the majority of properties the bulls are run with the females all or most of the year. Some cattlemen are attempting some form of control in this matter, but it is on all too few properties that mating is controlled.

The percentage of bulls mated varies from 2½–3% to 5–6%. The higher percentage is used where the breeders are run in a large paddock relative to their numbers, and where the watering points are scattered, as, for instance, where there is abundant surface water. When the cows converge on one or two main watering places this allows for easier coverage of the herd by the bulls.

The opinion of experienced cattlemen varies as to the best percentage of bulls; one man will say that the higher percentage results in more calves, another that the higher percentage leads to competition and fighting among the bulls with a consequent lowering of their efficiency.

There is, however, no doubt about the influence of water distribution upon the get of calves, and this has been repeatedly demonstrated by the evidence of poor calvings on those properties in good seasons when water was abundantly distributed all over the paddock.

The argument in favour of the non-segregation of the bulls is that where the calf-drop is distributed over the year there is less likelihood of being caught with a large number of small calves, and consequently the odds against a "smash" are lengthened.

**Branding.**

Because of the open range conditions under which the breeders are run, it is theoretically possible to find a difference of 12 months of age in animals belonging to any particular year number, and there are cases where this difficulty has to be met by assigning some of the particular branding the number of the previous year so that the discrepancy will to some extent be ironed out.

On the large properties the branding muster is carried out once a year and the other work (that is, taking the weaned males from the cows and taking off the cull cows to be spayed) is made to fit in with the branding muster. The muster, like most livestock work, is influenced by the season, but for efficient management and the elimination of cleanskins it should commence in September so that it can be completed by the following June, allowing a few months to make the final dispositions in the herd.

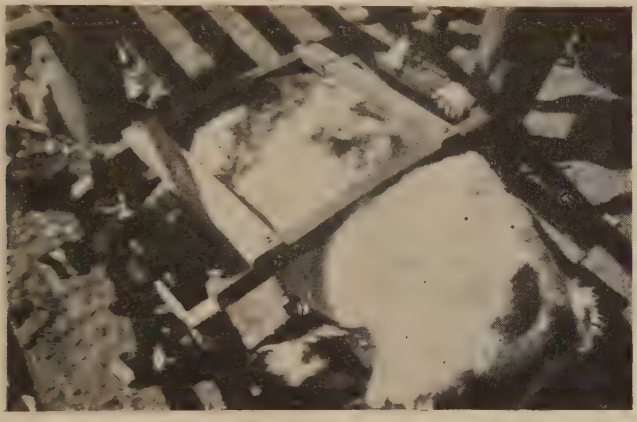


Plate 2.

**A Calf Being Held in a Cradle for Branding.**

On the smaller properties in the tick area (and the greater proportion of the region is in this area), the branding may be carried out as the cattle are mustered for dipping. In the marginal areas it may be done at mustering for inoculation against tick fever. Thus at practically all times of the year the cows have at foot some branded and some unbranded calves. Where the herd control is good, everything above 3–4 months old is branded.

**Weaning.**

The male calves are taken from the mothers at about 10 months of age and put into the steer paddock. As previously stated, it is the rule to leave the heifers in with the cows, and according to seasonal conditions they may calve at any age between 20 and 30 months. A few owners are taking the heifers off at weaning and holding them over till the next season before mating.

**Culling.**

Culling of females is done according to the seasonal conditions and the methods of the individual. The herd numbers are the deciding factor in the culling programme. In normal seasons, culling takes place

each year in the better appointed herd, the cows being cast for age, conformation, infertility, colour, temperament, and in odd cases, unfortunately, simply to reduce numbers regardless of the individual.

**Spaying.**

Spaying of the culled females is the usual procedure; mostly this is done by professional spayers. For many years the accepted rate of payment was about 1s. per head, but now at least twice this amount is charged. Cows are passage-spayed. Some operators use the flank method for maiden heifers and others work from the passage after using spreaders to enlarge the vagina.

**Dipping.**

The practice of dipping varies according to the season and the locality. The most severe tick infestation is found in the blacksoil country, and under conditions favourable to the tick it may be necessary to dip every three weeks for 2–3 months of the year. On some properties it is necessary to dip only a few times a year.

During recent years, resistance of ticks to arsenical preparations has become evident, and a large number of properties have changed over to DDT and BHC preparations. An additional incentive to the change-over has been the control obtained over buffalo fly and bush fly by the latter preparations, notably DDT.

Spray dips have gained in popularity throughout the region. While their merits are not unquestioned, they have certain obvious advantages over the plunge dips when dealing with weak cattle, in-calf cows, cows and calves, and fat bullocks.

## PARASITES AND DISEASES.

*Cattle Tick.*—The cattle tick is, next to drought, the greatest cause of economic loss among beef cattle in the Central Highlands. The whole problem is complicated by the fact that the degree of tick infestation recedes as one travels west from the Drummond Range, passing from marginal to clean country. It will be understood that the movement of cattle from east to west and vice versa is always attended by the danger of tick fever outbreaks, and as a matter of fact outbreaks of the disease are an annual occurrence in the marginal country. The losses occurring are hard to estimate, but they are not negligible; a reasonable estimate of tick fever losses in the region following the breaking of the 1946–47 drought is 2,000–3,000 head.

The direct and indirect losses due to gross tick infestation are hard to estimate, but heavy tick infestation contributes to cattle mortality during drought and semi-drought periods, more particularly on the large holdings.

The ticks contribute to the losses in several ways. It is at times noticeable that at the end of a good season, when cattle should be going into the winter in good fettle, gross tick infestation has so lowered their vitality that losses in the following dry spring are out of all proportion to the severity of the season.

A great deal of time is lost and mortality and economic loss brought about by the need for mustering and dipping weak cattle, especially cows in calf and cows with calves at foot. In such circumstances it is

often the dipping which is the last straw. The economic loss caused by the tick infestation and necessary mustering and dipping of fattening cattle is a severe drain on the industry.

Tick fever far outweighs any other disease in economic importance. The fear of an outbreak often restricts free movement of cattle and may result in an owner having to sell his stock below market value. The heaviest losses occur on the large holdings in the marginal country. Due either to seasonal conditions or to the passage of travelling cattle (and, it is sometimes suspected, horses) ticks suddenly appear in places which may have been free for several years. On one property in 1949 about 25% of the draft of 800 fat bullocks were wiped out, and as a result of the loss of condition caused by the outbreak the remainder could not be turned off that season and were later sold as stores. This is but one of the many instances where heavy blows have been dealt by the tick fever organism.

The control of tick fever outbreaks does not present any insurmountable obstacles. It has been demonstrated that routine inoculation included in the cattle management programme will reduce severe outbreaks to a minimum. With the latest type of automatic inoculating gun, an experienced operator can inoculate up to 500 per hour, so the slow progress which formerly was the chief objection to routine inoculation has now been eliminated and the operation can be dovetailed in with branding or dipping. This fact is becoming generally realized, and a scheme has been worked out by which a number of owners located at strategic points throughout the region purchase bleeders from the Department of Agriculture and Stock so that a supply of blood for inoculation purposes is always at hand.

*Buffalo Fly.*—Buffalo fly makes a seasonal appearance in the region. The severity of the first invasion by this parasite and the reaction of the cattle caused concern among cattlemen, but after the first wave spent itself subsequent reinfestations have been of a much milder nature. The buffalo fly is very susceptible to cold snaps and dry seasonal conditions, and the indications are that it can be practically eliminated by strategic dipping in DDT. The pest has a certain degree of economic significance when the infestation is sufficiently severe among bullocks or cows that are at the topping-off stage to keep them moving about and so necessitate control measures.

On these properties where arsenical dips are used, control of buffalo fly is obtained by spraying the backs of the dipped cattle in the draining pen with a DDT preparation from a knapsack spray or stirrup pump.

*Internal Parasites.*—Internal parasites do not constitute a major problem in the Central Highlands, but in wet seasons relatively severe infestation with *Haemonchus contortus* has been observed among young cattle. The degree of infestation has never been sufficiently severe to warrant control measures being put into operation, but this does not mean that there are not times when control is warranted.

*Bush Flies.*—Bush flies are more troublesome to horses than to cattle. They are generally regarded as being responsible for the spread of blight among cattle. Dipping in a good insecticide as a blight control measure apparently gives good results.

*Lice.*—In cattle which are neglected and have become low in condition, heavy lice infestation has been observed, but only in these isolated cases do they appear of economic importance.

*Contagious Pleuro-pneumonia.*—Contagious pleuro-pneumonia is endemic in a small area of the region—the Suttor River area—but sporadic outbreaks have occurred at widely scattered points throughout the whole of the Central Highlands. These outbreaks have always been severely limited by prompt quarantine and preventive vaccination.

*Blackleg.*—Outbreaks of blackleg occur from time to time in certain localities, one of these areas being in the vicinity of the Central Railway between the Drummond Range and Alpha.

*Leptospirosis.*—Leptospirosis in calves has been observed at Clermont and Springsure.

*Poison Plants.*—Various poison plants grow widely throughout the region and each year there are sporadic cases of plant poisoning and on occasions heavy losses in travelling stock.

The most widely-known disease under this heading is yellowwood poisoning caused by eating the leaves of the yellowwood tree. Mortality and economic losses due to this disease are particularly heavy on odd properties where there is a heavy growth of the tree, though on other properties and in other localities where the yellowwood tree abounds no losses occur. The poisonous principle has not so far been established but apparently varies in its effects on individual cattle and there appears to be an acute as well as a chronic form of the disease. So far no successful form of treatment has been found.

Mint weed has been the cause of heavy losses among travelling cattle in the Springsure-Rolleston and Clermont districts. This small weed grows profusely on the blacksoil country, where it may take possession of stock routes. In this case excessive nitrate is the cause of the poisoning. Recovery will be brought about by the prompt injection of methylene blue solution into the jugular vein or beneath the skin.

Other plants known to cause losses among cattle are heart-leaf poison bush, which grows on the desert country; Ellangowan poison bush, which grows widely throughout the region; and fuchsia bush, which is usually found around the edges of brigalow and gidyea scrubs.

Sporadic cases of plant poisoning occur throughout the region. Often the offending plant cannot be located, but in 1950 there was conclusive evidence to show that wild tobaccos were responsible for a number of these mortalities.

## TRANSPORT AND MARKETING.

The Central Railway crosses the region, and from the town of Emerald, which is situated almost in the centre, branch lines run north to Blair Athol (85 miles) and south to Springsure (44 miles).

Well defined stock routes radiate from various towns on the railway. Cattle trucked from different sections during a period of years are shown in Table 1.

A fairly recent development of the beef cattle industry in the region is the construction of saleyards throughout the area by stock companies and commission agents.

TABLE 1.

Rail Truckings of Cattle from Central Highlands, 1948-49 to 1952-53.

| Section. | 1948–49. | 1949–50. | 1950–51. | 1951–52. | 1952–53. |
|---|---|---|---|---|---|
| East of Emerald to Blackwater— | | | | | |
| Yamala .. .. .. .. | 453 | 253 | 228 | 358 | 380 |
| Comet .. .. .. .. | 3,691 | 1,510 | 3,299 | 2,799 | 4,252 |
| Blackwater .. .. .. .. | 8,298 | 7,026 | 6,298 | 5,940 | 12,605 |
| Emerald .. .. .. .. | 3,645 | 7,029 | 7,932 | 4,076 | 9,891 |
| South of Emerald to Springsure— | | | | | |
| Gindie .. .. .. .. | 227 | 165 | 121 | 253 | 468 |
| Fernlees .. .. .. .. | 1,708 | .. | 1,549 | 1,095 | 3,132 |
| Minerva .. .. .. .. | 1,420 | 640 | 985 | 759 | 1,215 |
| Springsure .. .. .. .. | 8,519 | 12,914 | 14,069 | 14,140 | 19,621 |
| North of Emerald to Blair Athol— | | | | | |
| Bullery .. .. .. .. | 360 | 416 | 208 | 667 | 698 |
| Capella .. .. .. .. | 4,378 | 4,261 | 2,266 | 3,496 | 5,533 |
| Retro .. .. .. .. | 301 | 548 | 1,837 | 1,016 | 1,849 |
| Nanya .. .. .. .. | .. | 276 | 578 | 429 | 572 |
| Langton .. .. .. .. | .. | .. | 27 | 94 | 2,083 |
| Clermont .. .. .. .. | 5,942 | 3,399 | 6,457 | 7,929 | 11,311 |
| Blair Athol .. .. .. .. | 14,548 | 24,549 | 23,164 | 23,726 | 22,949 |
| West of Emerald to Jericho— | | | | | |
| Taraborah .. .. .. .. | 380 | .. | 100 | 105 | 154 |
| Anakie .. .. .. .. | 422 | 365 | 428 | 522 | 608 |
| Withersfield .. .. .. .. | 3,690 | 3,426 | 4,081 | 3,444 | 3,902 |
| Bogantungan .. .. .. | 3,662 | 3,924 | 5,301 | 2,482 | 6,885 |
| Pine Hill .. .. .. .. | 9,910 | 8,224 | 7,925 | 6,121 | 8,389 |
| Alpha .. .. .. .. | 6,898 | 5,242 | 7,597 | 6,147 | 9,094 |
| Jericho .. .. .. .. | 2,011 | 2,023 | 3,948 | 4,404 | 2,303 |

When the producer has a draft of cattle for sale he has the choice of several methods of disposal. He may have them inspected on the property by a buyer of one of the meat exporting companies, who have buyers operating in all the cattle areas. Generally the buyer will inspect the cattle on horseback after they have been rounded up on a cattle camp. The buyer makes an estimate of the dressed weight of the animals he is inspecting, and each buyer works on a limit of so

Plate 3.

**Store Steers from the Cloncurry District in Emerald Saleyards.**

much per hundred pounds of dressed weight, which is altered in relation to the ruling market price. If the owner does not sell in this manner, he may—

(1) Truck his draft to the Rockhampton or Cannon Hill Saleyards and have his cattle sold through the yards.

(2) Send his cattle to the Brisbane Abattoir or one of the meat-works and have them killed on weight and grade (that is, he will get payment according to the dressed weight and grade).

(3) Sell the draft through the local yards, where there will be the advantage of competition among the local buyers, with perhaps some competition from outside buyers.

Droving cattle to the railhead is usually done by contract drovers. During the years of high cattle prices and scarcity of labour the contract price ranged as high as 15s. per head per hundred miles. For short trips and small mobs of cattle, the price may be worked out on a daily basis.

Along the main stock routes there are well defined camping places usually 6–10 miles apart, having a water supply and a good camping ground; the distance between these is the daily stage of travel.


## INOCULATION OF LEGUME SEEDS.

★ ★

The Department of Agriculture and Stock supplies cultures of bacteria for the inoculation of seeds of legumes such as Poona pea, blue lupins, lucerne and clovers.

Seed inoculation is often necessary where the legume intended for planting has not previously been grown successfully, as it provides the plants with bacteria which are necessary for their full development.

Cultures are supplied free and post free. They are in bottles and have to be mixed with skim milk for sprinkling on the seed.

Order from the Under Secretary, Department of Agriculture and Stock, Brisbane, at least 10 days before sowing. State amount and type of seed to be treated.

# Still More Wool!

## Part 3. How Many Sheep Can You Cull?

G. R. MOULE and R. E. CHAPMAN, Sheep and Wool Branch.

Sheep classing is one of the most important tools available to you as a sheep breeder. It can give you a far greater interest in your work, and used correctly it will result in: —

(1) A higher average cut per head from your sheep.

(2) A faster rate of increase in the average wool cut per head.

(3) A more even flock which will acquire a good reputation in your district.

(4) Surplus sheep such as cast for age ewes, cull ewes and wethers of which you can dispose.

Sheep classing is not a difficult job. You can do it yourself provided you know what you are aiming for as a sheep breeder and how to judge the main things you want in your sheep. The easiest way of doing this is to write down the things you will look for in your sheep and measure as many of them as possible. This may mean some extra work, but if you weigh the fleeces cut by each young ewe, and measure the length of the staples they grow and perhaps weigh the sheep themselves, you will find you have a lot of extremely valuable information.

The figures you collect can be used to tell you how much progress you can make with your job of increasing cuts per head by using different culling rates. You can actually measure the amount of wool you put on your sheep each sheep generation, or each year if your records are good enough. You can even find out how important are those different conformation faults that cause you to put a cull mark on a ewe!

You will have to do a few little sums to ferret out this information from your records. But they are not difficult and they will all be explained in some of the later articles in this series. In the meantime, let us consider some of the practical problems in sheep classing.

## Have I Enough Young Sheep to Class my Flock?

Breeding sufficient young sheep to be able to class your flock will probably be your first practical problem.

The number of surplus sheep you have in your flock will depend on the balance between births and deaths. If your average lamb-marking percentage is low and the death rates in your ewe flock are on the high side, you know how difficult it will be to keep your flock numbers up, let alone cull any young ewes. Of course, you can overcome some of these drawbacks by breeding your old ewes right out, by mating them each year until they finally die. You might also mate your ewes more than once a year, and try for two lambings every 13 or 15 months.

Even if by using both these methods you succeed in breeding sufficient sheep to allow you to cull some ewes, you still have to solve the problem of how deeply you can cull. The way to do that was explained in the articles dealing with "Vital Statistics and the Sheep Industry" in the *Queensland Agricultural Journal* of April, May and June, 1952. You can obtain a reprint from your nearest Sheep and Wool Adviser.

In Part 1 of these articles on vital statistics, it was shown how the relation between the level of culling you can undertake, your lamb-marking percentage, the number of years you breed your ewes and your annual death rate could be expressed as—

$$S = \frac{2{,}000{,}000}{M \times n \times (100-d)}$$

where S = the percentage of young ewes to be classed into your flock to maintain numbers.

M = your average lamb-marking percentage.

n = the average number of breeding seasons you obtain from each ewe.

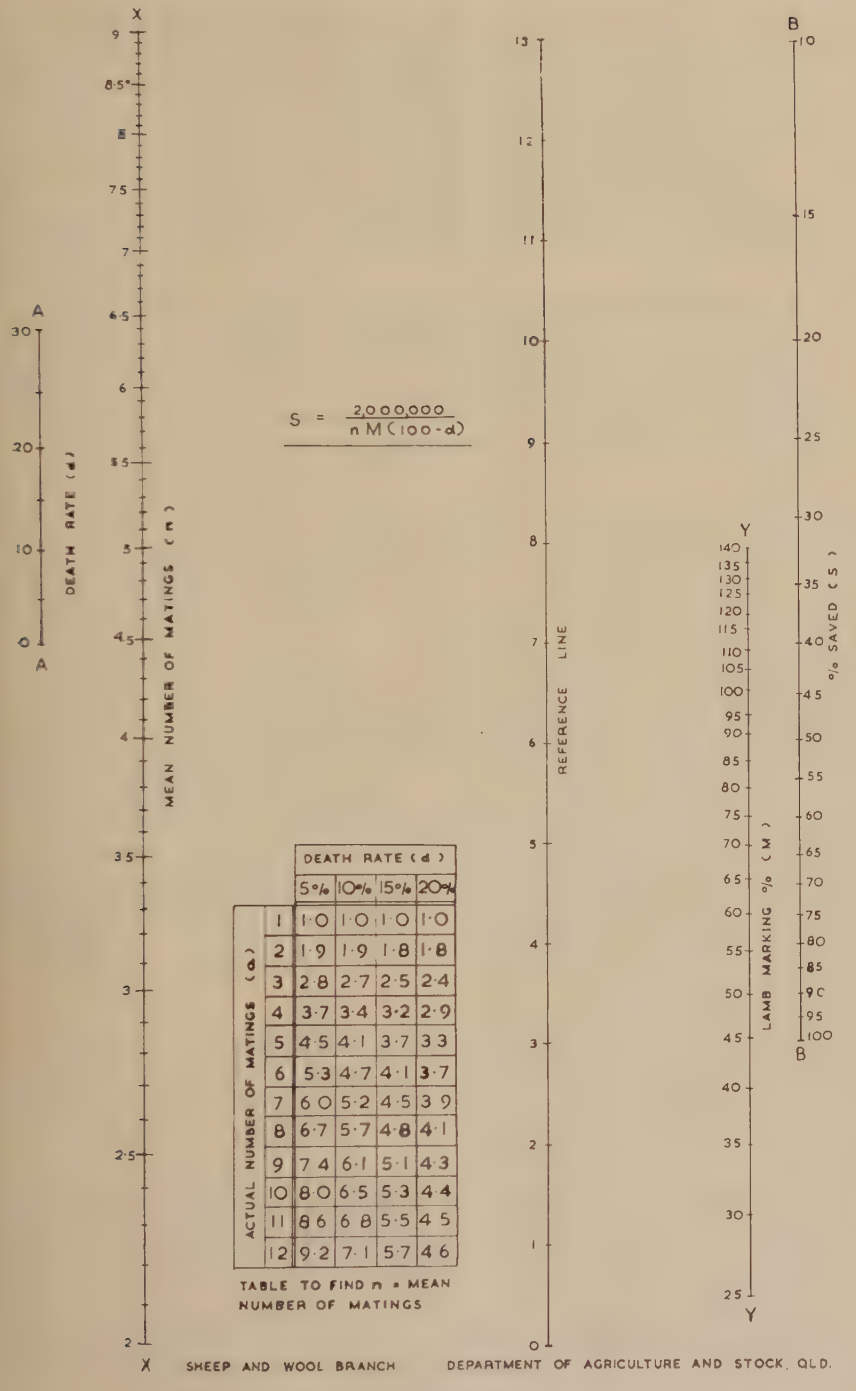
d = the average percentage of ewes that die each year.

It was also shown how you could make various calculations using this relationship. However, to save you this arithmetic a device known as a nomogram has been drawn by Mr. A. W. Beattie, of the Sheep and Wool Branch. It is shown as Fig. 1. Provided you know three of the quantities S, M, n and d, you can read off the fourth.

### How to Use Figure 1.

In the lower part of the figure you will notice a table. This converts the actual number of times you mate your ewes to the average number of matings per ewe (n) for average death rates of 5, 10, 15 or 20% (d).

For instance, suppose your annual death rate (d) is 10%, and you actually mate your ewes 5 times. By looking across from 5 in the left hand column to the column under 10%, you see the number 4·1, which is the average number of matings you get from each ewe (n). Just how this number is obtained was explained in Part 1 of the articles on vital statistics.




$$S = \frac{2{,}000{,}000}{n\,M(100-d)}$$

| ACTUAL NUMBER OF MATINGS (d) | DEATH RATE (d) 5% | 10% | 15% | 20% |
|---|---|---|---|---|
| 1 | 1·0 | 1·0 | 1·0 | 1·0 |
| 2 | 1·9 | 1·9 | 1·8 | 1·8 |
| 3 | 2·8 | 2·7 | 2·5 | 2·4 |
| 4 | 3·7 | 3·4 | 3·2 | 2·9 |
| 5 | 4·5 | 4·1 | 3·7 | 3·3 |
| 6 | 5·3 | 4·7 | 4·1 | 3·7 |
| 7 | 6·0 | 5·2 | 4·5 | 3·9 |
| 8 | 6·7 | 5·7 | 4·8 | 4·1 |
| 9 | 7·4 | 6·1 | 5·1 | 4·3 |
| 10 | 8·0 | 6·5 | 5·3 | 4·4 |
| 11 | 8·6 | 6·8 | 5·5 | 4·5 |
| 12 | 9·2 | 7·1 | 5·7 | 4·6 |

TABLE TO FIND n = MEAN NUMBER OF MATINGS

Fig. 1.

**A Nomogram Which Relates the Percentage of Young Ewes Classed into a Flock with Lamb-Marking Percentage, Number of Times the Flock is Mated, and the Annual Death Rate.**

Figure 1 can be used to find the answers to three important questions you will encounter in sheep classing. They are:—

(1) What percentage of young ewes will I have to class into my flock to maintain its strength?

(2) What lamb-marking percentages will I have to maintain to allow a fixed culling rate?

(3) How many times do I need to mate my ewes before casting for age?

### 1. What Percentage of Young Ewes will I have to Class into my Flock?

You can find the percentage of young ewes you will have to select (S) to maintain numbers if you know your average lamb-marking percentage (M), the mean number of matings per ewe (n) and the annual death rate (d) in your ewe flock.

To do this, join your value of n on scale X with a rule to your value of M on scale Y. Note where the rule cuts the central reference line. Then join this point with your value of d on scale A on the left, and look along to where the rule cuts the percentage saved on scale B on the right. This will give you the percentage of young ewes you will have to class into your flock to maintain numbers (that is, S).

For example, let the lamb-marking percentage (M) = 65%, the death rate (d) = 10% and your actual number of matings be 5.

First of all you will need to obtain the mean number of matings (n) corresponding to 5 actual matings with a 10% death rate. From the table you see that this is 4·1. On the figure, join 4·1 on scale X with 65 on scale Y. This cuts the reference line between 5 and 6. Join this point with 10 on scale A on the left and look along the rule to scale B on the right. Here you arrive at a number of 84, for the percentage of young ewes you will have to class into your flock. This means you can cull 16% of your young ewes and still maintain your numbers.

You may have noticed that you always use scale X with scale Y, and scale A with scale B.

### 2. What Lamb Marking Percentages will I have to Maintain?

A second way in which Figure 1 can be used is to find what lamb-marking percentage (M) you would have to obtain to allow you to class in a certain percentage (S) of your young ewes for a given death rate (d) and certain number of matings (n).

This time join your value of d on scale A with your desired value of S on scale B. Note where this cuts the central reference line and join this point to your value of n on scale X. By looking along the rule to where it cuts scale Y, you see what lamb-marking percentage (M) you would have to obtain.

As an example, say you wished to be able to cull 40% of your young ewes (that is, class in only 60% (S)). Suppose you only want to mate your ewes 6 times and your annual death rate is 5% (d).

Join 5 on scale A to 60 on scale B, noting that the rule cuts the reference line just below 6. The mean number of matings (n) (from the table), corresponding to 6 actual matings and a 5% death rate,

is 5·3. So join 5·3 to the point just below 6 on the reference line and look along to where the rule cuts scale Y. This shows that with a 5% death rate you would need a 66% lamb marking to be able to cull 40% of the young ewes and cast your ewes after their sixth mating.

### 3. How many Matings do I need to get from my Ewes?

If you know your annual death rate (d) and average lamb-marking percentage (M), you can find from Figure 1 the number of times you would have to mate your ewes to maintain a given level of selection (S).

To do this join your value of d on scale A to your desired level of selection (S) and note where the rule cuts the reference line. Next join this point to your value of M on scale Y. Looking along to where the rule cuts scale X, you will see the mean number of matings per ewe (n) you would require. Then from the table you can find the actual number of matings that corresponds to this mean number (n) for your particular death rate (d).

Suppose your death rate (d) is 15% and your lamb-marking percentage (M) is 65%. Suppose you want to find the number of times you have to mate your ewes so as to be able to cull 20% of your young ewes (that is, select 80%).

Join 15 on scale A to 80 on scale B. The rule cuts the reference line about midway between 5 and 6. Join this point to 65 on scale Y, and if you look to the left you will see from scale X that you need 4·6 matings per ewe. From the 15% death rate column in the table you will see that an average of 4·5 matings per ewe corresponds to 7 actual matings of the ewe flock. However, you would need to breed about a third of your old ewes for an eighth season to obtain a mean number of matings of 4·6.

To have much scope in classing you need high average lamb-marking percentages and low death rates. Provided you have reasonably accurate records, Figure 1 will enable you to find out just how deeply you can cull your flock. By using this with your fleece weight records, you could see by how much you could improve your cut per head by classing.

### COUNTRY BREAKFAST SESSIONS.

The Rural Broadcasts Section of the A.B.C. is now providing regular breakfast sessions of interest to rural people from 4QY, 4AT and 4QS, Monday to Friday from 7 to 7.15.

Harry Greaves, stationed at Cairns, handles the northern programme, and Trevor Stockley conducts the southern programme from Toowoomba.

# The Principal Disease Problems in Our Poultry Industry.

P. RANBY, Assistant Veterinary Officer.

In our poultry industry disease rates high as a cause of economic loss. This loss is in the form of deaths, checking of growth, and loss in egg production.

The most important diseases are:—

(1) Respiratory diseases.

(2) Fowl leucosis.

(3) Coccidiosis.

Perhaps we could call these the "big three." In addition, we could list the following as being of importance in special circumstances:—

(4) Blackhead.

(5) Pullorum disease and salmonellosis.

(6) Roundworms.

(7) Bluecomb.

(8) Botulism.

(9) Stickfast flea (*Echidnophaga gallinacea*).

(10) Fowl tick and fowl tick fever (spirochaetosis).

## 1. Respiratory Diseases.

The respiratory diseases of poultry are due to a number of different agents but the symptoms are all related to the respiratory tract and so are similar. Thus we may have coughing, sneezing, throat rattles, gaping, snotty nostrils, watery or "bunged up" eyes, distended sinuses, and cheesy deposits in the mouth and throat. These symptoms are referred to as the "roup complex." A bird showing one or more of these symptoms is regarded as being affected by roup, or rather, one of the roup diseases.

The different types of the "roup complex" seen in Queensland are as shown in Table 1.

TABLE 1.

TYPES OF ROUP DISEASES.

| Name. | Cause. |
|---|---|
| Infectious laryngo-tracheitis (I.L.T.) | Virus |
| Infectious catarrh | Virus |
| Coryza | (*a*) *Haemophilus gallinarum*<br>(*b*) Minute coccobacilliform bodies |
| Fowl pox (respiratory form | Virus |
| Cholera (respiratory form) | *Pasteurella aviseptica* |
| Vitamin A deficiency | Nutritional |

Several respiratory diseases which occur overseas are not found in Australia. The most notable of these are Newcastle disease and fowl pest. That is why we prohibit introduction of eggs or fowls from any other country but New Zealand.

Distinguishing between the "roup" diseases in the poultry run presents a problem. Where difficulty is experienced, laboratory methods are used as an aid.

*Infectious Laryngotracheitis (I.L.T.).*—I.L.T. is probably the most important of the group. It was first discovered in Queensland in 1953 by the finding of immune antibodies in blood samples taken from fowls on several selected farms in the Brisbane area. The presence of the immune antibodies showed that the birds had contracted the disease at some time and had recovered. This led to a hunt for the virus, which was isolated about three months later. The disease has been present in other States for some time.

I.L.T. attacks the trachea (windpipe) and often also the nasal cavities and eyes. The lining of the trachea may be severely inflamed and there is often bloodstained mucus present. In cases that are recovering, the main lesion is the presence of cheesy plugs in the larynx and upper trachea, rendering differentiation from the other respiratory diseases more difficult. The outbreaks so far reported in Queensland are of the mild type (Plate 1).

Plate 1.

**Affected Birds in an Outbreak of Infectious Laryngotracheitis (I.L.T.) in Southeastern Queensland.** Note the gaping of the Australorp.

New season chickens can be protected against I.L.T. by vaccination. This is done by applying the living virus to the cloaca, the cavity within the vent. Vaccination against I.L.T. is done on a wide scale in other States and has recently been commenced under supervision in Queensland, using the local strain of virus.

*Infectious Catarrh and Coryza.*—These are more or less similar in their effects, producing a mild respiratory involvement, but often they persist for weeks, interfering with growth and egg production and sometimes causing much loss of condition. In young birds which are in good condition, are not "wormy," receive an adequate supply of vitamin A in the form of good green feed or fish-liver oils, are not over-crowded and receive proper ventilation, the "cold" will generally run its course for about three weeks and then clear up.

*Fowl Pox.*—Fowl pox often produces mouth "cankers" and cheesy deposits in the throat in a proportion of affected birds (respiratory form). However, some birds will always show the skin form, with typical wart-like growths on the face and wattles, and so a diagnosis can be made.

Plate 2.

**Case of Fowl Pox.** Note the wart-like growths on the head.

Fowl pox infection and fowl pox vaccination cause other respiratory infections to flare up if they are present at the same time.

Prevention is by vaccination with fowl pox vaccine. In some cases,

pigeon pox vaccine may be used instead.

*Cholera.*—Cholera causes swollen wattles and sometimes symptoms similar to those of coryza and infectious catarrh. The cholera bacillus is often isolated in cases of "cold" and may be present in conjunction with the coryza bacillus.

*Vitamin A Deficiency.*—This can be identified by the presence of characteristic pustules at the back of the throat (Plate 3). These may extend down the gullet. The eyes are often swollen and watery. The kidneys become swollen and engorged with crystals of urates.

Plate 3.
**Pustules in Throat Due to Vitamin A Deficiency.**

In severe vitamin A deficiency, mortality may be heavy. In mild deficiency, the birds are not as thrifty as they should be and become predisposed to roundworms and respiratory infections.

Vitamin A is the most important vitamin in practical poultry feeding. It is supplied as fish-liver oils in the mash (wet or dry) or as good green feed such as lucerne, kohl rabi and silver beet. Chickens should always receive fish oils for the first six weeks of life because they cannot handle green feed as well as adults.

## 2. Leucosis.

The leucosis complex is associated with a wide variety of symptoms, such as leg paralysis (Plate 4), dropped wing, pearly eye, cancer-like growths in the internal organs, and so on. Hence, the different forms are referred to as the neural (nerve) form, eye form, visceral form, blood form and so on.

Plate 4.
**Fowl Affected With Leucosis.**

The cause of leucosis is a virus. Virus isolated from any one form of the disease can reproduce all the other forms on inoculation into experimental chickens.

Infection for the most part occurs early in the bird's life—within the first two months. Little infection occurs after 12 weeks of age. The incubation period may be long. The disease first makes its appearance in a flock after the birds are three months of age and odd cases occur from time to time for as long as the fowls are kept.

Mortality at any one time is seldom high, but over a period of months it can add up to a fair proportion of the flock.

Transmission is mainly by direct contact, but sometimes the disease is transmitted through the egg. Red mites and fowl ticks are possible mechanical carriers.

The best means of control is to breed for resistant strains of fowls, but little has been achieved in this respect in Queensland.

Fowls showing early signs of the disease should be culled at once in order to reduce the exposure of the others to the virus and to ensure some financial return for the carcase before much loss of weight occurs.

The incidence of leucosis depends a lot on the degree of exposure to the virus. Chickens should be kept away from adult birds because the disease is contracted early in life.

### 3. Coccidiosis.

Coccidiosis is the terror of our chick population. It is due to a microscopic protozoan parasite which undergoes a life-cycle in the gut of the bird. Finally the parasite passes out with the droppings in the form of oocysts. The severity of the disease depends on how many oocysts are picked up in a short time off the ground.

There are two types of coccidiosis in chickens—caecal and intestinal.

*Caecal Coccidiosis.*—Caecal coccidiosis is due to *Eimeria tenella,* which attacks the blind-gut (caecum). If the infestation picked up is heavy enough, a severe haemorrhagic inflammation of the blind-gut with free escape of blood into the cavity of the bowel occurs. Caecal coccidiosis attacks mainly young chickens—from about three weeks to up to two months of age.

Chickens which pick up only small doses of oocysts over a period develop a strong resistance to the disease. Battery chickens are unable to develop a resistance to coccidiosis and are referred to as "soft" chickens by poultry farmers. If they are kept in the batteries too long (over a month) before bringing to the ground, an outbreak of acute caecal coccidiosis is likely.

Very severe outbreaks of caecal coccidiosis are not uncommonly seen in the field. The incidence and severity of caecal coccidiosis is generally greater in wet seasons, which are conducive to the survival of the oocysts on the ground.

*Intestinal Coccidiosis.*—The intestinal form is associated with several species of coccidia. The lesion produced is a mild but chronic inflammation of the small intestine. Mild congestion with punctiform haemorrhages of the intestinal mucous membrane is seen. The wall of the intestine becomes thickened.

Intestinal coccidiosis affects older chickens and the development of resistance against it is much less noticeable than is the case with caecal coccidiosis.

Mortality from intestinal coccidiosis is low, but affected birds become unthrifty. They have often to be culled when other birds in the same pen are commencing to lay.

*Control.*—The chickens should be kept under dry conditions. For this purpose, fresh litter in the form of wood shavings, sawdust or short (chaffed) straw is useful. The litter is occasionally turned and oocysts are thereby dispersed through the litter instead of being concentrated on the surface. A concrete floor is essential for dry conditions.

Chickens should be kept away from adult birds and should not be run on ground previously occupied by adults.

Battery chickens should be brought to the ground at three or four weeks so that they do not become too "soft." Where cockerels are kept in batteries for fattening, this does not matter, for they never touch the ground.

The use of the sulphonamide drugs considerably aids the control of coccidiosis. The two most commonly used

are sulphaquinoxaline and sulphamezathine, supplied in the drinking water. Sulphaquinoxaline is more palatable than sulphamezathine.

Sulphonamides can be used only for a limited period of treatment owing to their toxic effect. In outbreaks which are not "explosive," the sulphonamide should be used somewhat sparingly so that the life-cycle of the parasite can proceed at a limited rate, allowing the chicks to develop a resistance. This is done by allowing longer breaks in the course of treatment. If the full dosage is given when only a few chicks show signs of coccidiosis, no immunity will develop and the disease is likely to appear when the drug is withdrawn and can no longer be given.

Other drugs are also used for the control of coccidiosis but they interfere too much with the early developmental stages of the parasites' life-cycle, so no immunity develops. Sulphonamides suppress the later stages and allow some immunity to develop.

Blackhead is the main disease of turkeys and turkey raising is largely confined to the dry, inland areas where conditions are less favourable for the parasite. Chickens are occasionally affected by blackhead.

Control is by keeping turkey poults away from adult turkeys, chickens and fowls. The turkey poults should be raised on ground which has never carried chickens or adult fowls or turkeys. Rotate the poults between several pens. Feed Enheptin–T as a preventive if blackhead is troublesome. This drug is of much less value once blackhead is well established in the turkey poult.

### 5. Pullorum Disease and Salmonellosis.

Pullorum disease due to *Salmonella pullorum* is transmitted from an infected hen through the egg to the chick. The down of the newly hatched infected chick is heavily contaminated;

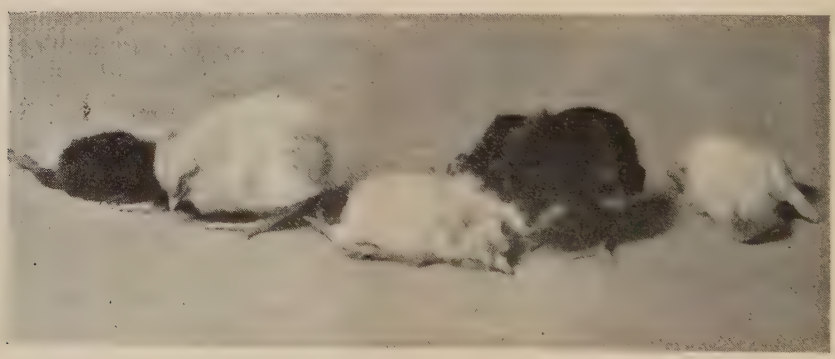


Plate 5.

**Pullorum Disease—Sick and Dead Chickens.**

### 4. Blackhead.

Blackhead is due to a protozoan parasite which attacks the blind-gut. The lesions produced are different from those of acute caecal coccidiosis. In blackhead we find thickening of the wall and formation of casts of dead tissue within the cavity of the blind-gut.

The organism can persist on the ground in the eggs of the small roundworm which lives in the blind-gut.

as it dries it is carried throughout the brooder by the ventilation system, and so spreads infection. The disease appears in the other chickens in a few days and mortalities of 90% are common (Plate 5).

Treatment by the use of sulphonamide drugs in the drinking water gives fairly good results in outbreaks. In Queensland, the disease is controlled by requiring all hatcheries to have their breeding stock pullorum tested.

This work is done by the Department of Agriculture and Stock for a small fee.

Outbreaks of salmonellosis in newly hatched chickens may occur, but due to modern methods of incubator disinfection with formalin vapor they are uncommon.

### 6. Roundworms.

Roundworms are most troublesome in chickens, older birds developing a resistance to them. Roundworms cause stunting of growth, and anaemia. Chickens which are run under overcrowded conditions, or which have had their resistance lowered by disease, tend to carry greater worm burdens. There are two roundworms of poultry and the treatment for each is different.

The large roundworm (*Ascaridia galli*) is the main one and it is found in the small intestine. Individual treatment of each bird with capsules of tetrachlorethylene or with carbon tetrachloride is effective.

The small roundworm (*Heterakis gallinae*) is found in the blind-gut. Treatment is by the use of phenothiazine mixed up in a mash and given as a flock treatment. Some farmers use phenothiazine as a general worm treatment because it is easy to give. This is a mistake because the drug is ineffective against the large roundworm.

### 7. Blue Comb or Black Comb.

This disease, also called "pullet" disease and uraemia, is a disease mainly of laying pullets. Its cause is unknown. The most constant lesion found is nephritis, the kidneys being pale, swollen and frosted.

It can occur in a mild form, causing sudden drop in egg production; many birds become fevered. In the severe forms, mortality can be heavy, affected birds dying within one to two days. For some reason, the severe form has become more prominent over the last two years.

### 8. Botulism.

Botulism is due to the ingestion of the poison produced by *Clostridium botulinum*. This micro-organism multiplies in meat left on the ground or decaying organic matter and produces a most powerful poison. Ducks or fowls eating such meat, dead frogs, &c., are liable to develop botulism. Affected birds develop a flaccid paralysis. The head sways about and as paralysis progresses may even be rested on the ground. Some affected birds recover, depending on the dose of poison ingested.

### 9. Stickfast Flea.

The trouble centre for stickfast flea (*Echidnophaga gallinacea*) is in the Boonah area. The flea attaches itself to the head (Plate 6) and often causes mortality in chickens if the infestation is heavy. Stickfast flea also attaches itself to dogs and cats, rendering eradication difficult. Since the advent of DDT, the control of stickfast flea has become more effective.

Plate 6.
**Stickfast Flea on the Head of a Fowl.**

### 10. Fowl Tick and Fowl Tick Fever (Spirochaetosis).

The fowl tick (*Argas persicus*) is found in dry areas and is not often seen on the coast. The adult tick does not stay on the fowl but hides away in cracks, crevices and under bark of nearby trees. It feeds at night. The immature stages of the tick are found on the fowl, particularly under the wings.

The fowl tick transmits a spirochaete (*Borrelia anserina*) which causes fowl tick fever or spirochaetosis.

Control is by spraying the fowl houses periodically with kerosene/soap emulsion or with creosote.

Fowls can be vaccinated against the spirochaete but the immunity is short-lived (4–6 months).

## PASTURE TRIALS ENCOURAGING.

Encouraging results are being obtained from trials with green panic and buffel grasses on dairy farms in the Fassifern Valley and at Tamborine Mountain. These trials are being conducted by the Dairy Pasture Improvement Advisory Committe and are under the supervision of the Senior Agrostologist of the Department (Mr. S. Marriott).

Remarkable promise is being shown by green panic and buffel grass on a trial on forest country on Mr. H. Slatter's dairy farm in the Fassifern Valley.

On red basaltic soil on Mr. J. Bartle's property at Tamborine Mountain, excellent growth of Guinea grass, buffel grass, and to a lesser extent green panic and molasses grass, has been made. These grasses are being used to colonise rough ground previously covered with lantana. The lantana is brushed and burnt and these pioneer grasses are sown in the ash.

The cattle on the farm, which are normally carried on thick kikuyu, graze in this rough country which was previously inaccessible. In this way kikuyu grass is spread by the seed carried by the animals from the existing kikuyu pasture on the developed part of the farm.

Regrowth of lantana is sprayed with a hormone spray once a year for two years and the lantana is then under control.

Pasture improvement by contour furrowing has been effected in a number of districts. On one property in the Beaudesert there was a complete absence of runoff from a treated pasture when about five inches of rain fell in six hours. On adjacent untreated pastures there was a considerable runoff of storm water, which was lost as far as the future growth of these pastures is concerned.

This form of moisture conservation is proving effective on many types of soil, including sandstone country and basalt soils.

# Sanitation in Pig Raising.

F. BOSTOCK, Officer in Charge, Pig Branch.

The fact that many pigs live and thrive in filthy pens or yards would seem to justify the general belief that the pig is a dirty animal. However, such is not the case and it would be more correct to believe that the pigs kept under these conditions are extremely unfortunate in not being able to select their own surroundings or living conditions. If given the facilities there is probably no cleaner animal than the pig.

It is a common custom to place the piggery anywhere so long as it is out of sight. The sty very frequently is built of second-hand bush timber. Often the pigs are enclosed in small yards in lowlying situations, with the result that they get little exercise and the enclosure soon becomes a quagmire in which the animals sink to their bellies and are exposed to dampness, cold, draughts and, in summer, sweltering heat.

Probably there is no other period when pigs need more care and better treatment than from birth to weaning. As a rule the disease-resisting powers or young pigs are low, but bacteria require certain conditions for existence and growth and many disease-producing germs will not develop or multiply outside the particular animal which they affect.

Temperature requirement varies, but a high temperature, such as that of boiling water, is very destructive to all bacterial life. Cold does not appear to have as great an influence as heat, but as a rule it may be said that the range of temperature for the most favourable growth and multiplication of bacteria liable to affect pigs is from 100° to 110° F.

Moisture is necessary for bacterial growth, although germs may exist for some time in dry dusty places, apparently more or less dormant. Few bacteria can resist the direct rays of sunlight.

## Why Cleanliness is Essential.

The pig, in common with all other animals, possesses varying powers of germ resistance which may be greater in one pig than in another, but, as a rule, the younger the pig the lower its resisting powers. However, even if the resistance is low the disease-producing germs must be introduced into some favourable spot for development, such as inflamed or irritated membranes of the mouth, bruises, and cuts. Under healthy conditions, the introduction of only a few germs may not produce a disease; if, however, a great number is introduced the pig's resistance is eventually overcome and disease follows. If by poor feeding, either in amount or composition, bad housing, poor ventilation, allowing pigs to catch cold, lack of exercise, or any other weakening influence, the pig's vitality is lowered, a much

smaller number of germs may produce a disease. If on the other hand we are able to keep the pigs' powers of resistance at their highest by good housing and sanitary conditions, many of the ills that usually affect them will not occur.

### Cheap Disease Insurance.

Frequent disinfection keeps the number of bacteria at a low level, while careful management keep the pigs' vitality at a high point, so that they are better able to resist any germ invasion. Increased resistance due to proper management is the cheapest protection against disease.

It is of much greater importance to the pig-raiser to know how to prevent disease than it is to know how to treat the animals after they become sick. Any sick pig, even though it recovers, has its normal development retarded, thus reducing the margin of profit.

Only constant watching on the part of the farmer can guard against attacks of disease, only by continually waging war upon disease producing germs can the best results be obtained. The natural method of checking the growth and multiplication of harmful germs is to prevent as far as possible the conditions favourable for their growth and maintenance. Cleanliness should be insisted on and all dark corners should, if practicable, be exposed to sunlight. Dry quarters are much more sanitary than damp ones, because the conditions for germ development are less favourable. Frequent cleaning and disinfecting of all sleeping quarters, pens and yards are very necessary, and dry well-drained feeding floors very desirable, as pigs should not be expected to pick their food out of a mud wallow.

### Importance of Pure Drinking Water.

As a necessary precaution against the growth of germs and consequent repeated invasions, the water intended for the pigs should be pure, water troughs should be kept clean and no opportunity allowed for the pigs to drink from muddy, scummy pools or wallows.

If some means of cooling other than shade is necessary, artificial wallows made of concrete should be used, as these can be kept clean at a minimum of expense. Farmers take great risks at all times in allowing their pigs to wallow in a running stream, unless they know definitely that there are no other piggeries further up-stream. In no circumstances should the dumping of dead pigs, bedding, or other litter into the stream be allowed.

### Disinfectants.

In addition to checking the growth of harmful germs by making conditions unfavourable for their development, the actual killing of the germs by use of disinfectants is strongly advocated, and is necessary in controlling disease.

As before stated, direct sunlight is a very powerful disinfectant, and has the added advantage of costing nothing. When shielded from the direct rays of the sun and protected against the effects of disinfectants by being covered by mud, dust, manure, straw, or other litter, many disease-producing germs are capable of existing for long periods of time. Any shelter used in housing pigs should therefore be built, or if already built, should be altered to allow all the sunlight possible to enter. The frequent cleaning and exposing to the sun of feed and water troughs will naturally suggest itself as a means of preventing the spread of disease germs in these places.

### Direct Contact Essential.

There are several chemical disinfectants which will destroy germs when brought into direct contact, so care must always be taken to see that direct contact is established. For this reason the thorough cleaning of pig houses, the removal of false floors and the forcing of disinfectants into all cracks, corners, and crevices of the buildings are very important.

Among the proved disinfectants may be mentioned caustic soda and boiling water (5 lb. caustic soda to 10 gallons boiling water), also a 3 to 4 per cent. water solution of a reliable coal tar disinfectant.

Two fairly good disinfectants are common lime and chloride of lime. Their principal use in a disinfecting solution is to furnish a basis of a whitewash, so that it may be determined where the spray is going and whether or not any small patches are being missed.

## Method of Disinfecting.

In view of the fact that it is sometimes difficult, and always somewhat laborious, even under the best of conditions, to keep pig houses and small pens free from infection, the practice of inducing the pigs to live as much as possible out of doors should be observed. No place offers more advantages from the point of view of sanitation than does clean pasture.

The frequency with which pig shelters and pens should be cleaned and disinfected is governed by the weather, time of year, and number of pigs in any particular place. In damp, cold weather, the bedding becomes wet and filthy in a very short time, and cleaning is necessary perhaps several times a week.

When cleaning pig houses and yards, the bedding manure or other litter should be removed and if practicable scattered thinly over a paddock in which there are no pigs. If it is allowed to remain in the yards the pigs will root and work over the litter, rendering the cleaning process of little value.

Feeding floors should be cleaned frequently so that the feed will remain clean until eaten, or, if no floor is provided, the trough should be moved to a new position each day, so as to avoid the possibility of a puddle hole being formed, which is usually the case when feeding is carried out on one spot for some time.

A large number of pigs kept in a small area necessitates constant care in keeping their quarters clean. Many farmers would have better success with their pigs with less work if the pig yards were larger and afforded more range; all diseases appear oftener and flourish better in crowded places.

It is alway safer to clean a little too often than not often enough, cleanliness being one of the first principles in pig raising.

A powerful spray or bucket pump and a reliable water solution of some coal tar disinfectant with enough lime added to make a thin whitewash are the best means of combating infectious diseases likely to affect pigs. It should always be remembered that it is only after thorough cleaning that efficient disinfection can be done. The use of a pump is advisable, since the disinfecting spray should be forced into all cracks and crevices; an efficient job cannot be done by using a brush or scattering a few lumps of lime in a pig house or yard. Care should always be taken to see that all surfaces which are not exposed to direct sunlight are thoroughly sprayed.

Chloride of lime may be used in the disinfection of bedding, manure and other refuse and should be thoroughly mixed with the material to be disinfected. A safer method, where practicable, is to burn all straw after it has been scattered thinly over some paddock to which pigs do not have access, and the residue should be exposed to the sun for a month or more before being ploughed under.

## Filth Favours Parasites.

Many of the same conditions which favour the presence and development of germs are also favourable for the development of worms, lice, and mange. These parasites are important factors in lowering the vitality and disease-resistance of pigs. While they do not cause many deaths, they pave the way for the invasion of disease-producing germs. Because of the weakened condition of the pigs, these

germs meet with slight resistance and many deaths may result which could otherwise have been prevented.

Most attacks of pneumonia may be put down to the exposure of weakened pigs, while low vitality may be attributed to bad housing, poor food, attacks of worms, lice and bacteria. Strong vigorous pigs in good quarters rarely suffer from pneumonia.

The same measures employed in destroying germs destroy lice and worms. The disinfection of sleeping quarters, yards and troughs kills great numbers of lice which may for the time being be off the pigs, and a part of the life cycle of intestinal worms is spent outside the animal's body. Therefore, clean pastures, water troughs, feeding floors and utensils and their careful disinfection will undoubtedly destroy many immature worms before they enter the pig's body.

## Summary.

Most diseases in pigs are caused directly or indirectly by bacteria, lice and worms.

Sanitation amounts to continued war on bacteria and conditions favourable to their maintenance or growth.

The healthier the pigs the more rapid and more economical are their gains in live weight.

Keep pigs healthy by—

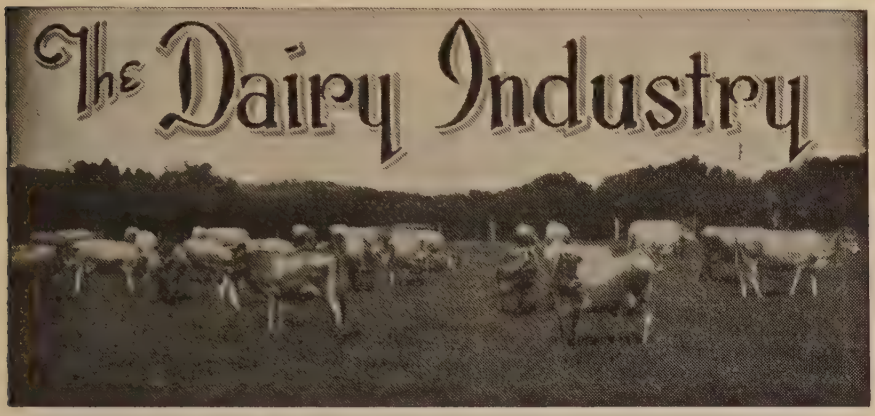
1. Keeping yards and runs free from mud holes.
2. Providing clean water.
3. Cleaning and disinfecting frequently and regularly.
4. Providing dry, clean, and draught-free quarters.
5. Feeding proper rations.
6. Grazing pigs on clean pasture.


## TOBACCO GROWERS.

The Department of Agriculture and Stock now has for sale seed of the following varieties:—Virginia Bright Leaf, Mammoth Gold, 400, 401, 402, Yellow Special, Kelly, Gold Dollar, Hicks, and Virginia Gold.

The price of this seed, cash with order, or C.O.D., is 6s. per oz. to registered Queensland tobacco growers and 10s. per oz. to others.

Address enquiries to The Under Secretary, Department of Agriculture and Stock, Brisbane.




# Trends in Dairying Overseas.

L. E. NICHOLS, Director of Research, Division of Dairying.

During the second half of 1953 I was privileged to attend the World's Dairy Congress at the Hague, Holland, and to visit institutions, laboratories, factories and farms in Western Europe, the United Kingdom and the United States of America.

## Techniques of Production and Manufacture.

A very high standard of dairying has been achieved in the countries visited—the United Kingdom, Ireland, Holland, Denmark, Sweden, Switzerland and the United States. There has been a complete recovery from wartime conditions, and in most countries production is now equal to or greater than the pre-war figures.

Plate 1.

**High Producing Friesian Cattle in Holland.** This group averaged 1,500 gallons per cow per annum.

A detailed report on the observations which I made overseas has been submitted to the authorities concerned. A summary of general trends, and their application or relationship to Australian dairying, is given in this article. Some aspects of farm production will be dealt with in more detail in a subsequent article.

Subsidies and price supports have helped to expand production, especially in England and the United States.

The principal objective now is to reduce costs of production, processing and distribution. Farm and factory mechanisation is proceeding in order to save time and labour.

There is a general feeling that the price of dairy products has reached the upper limit consistent with a reasonable volume of sales and that a levelling-off in costs must now be expected with a return to full peace-time economy.

Comparison of prices is difficult in these days of controlled exchange rates. One may make comparisons at par or at current rates of exchange. The former seems to be the more desirable: after all, practically all costs are paid for in the currency of the country concerned and not in the adjusted currency of some other country.

In Holland, Denmark and Sweden the farmer receives something under 2s. sterling per gallon for standard milk of 2.5 to 3.5% fat, with additional small incentive payments for various aspects of quality. The overall price would probably be 2s. 6d. to 2s. 8d. Australian, and this in spite of the increased costs imposed by the need to stall feed cattle for about six months.

In England, where the dairying industry is based on market milk, it is necessary to even the output by providing a high winter incentive. The price for market milk ranges from 2s. 11.38d. to 3s. 6.17d. per gallon, and averages about 3s. 11d. Australian. The price of milk in England, irrespective of the use to which it is put, has encouraged the feeding of concentrates and this has undoubtedly increased the production of milk.

In anticipation of the change-over from Government buying to trader-to-trader marketing of imported dairy produce in Great Britain, countries such as Holland and Denmark are taking care not to price their products out of the export market.

Most countries visited are advertising effectively to increase the sale of dairy produce and are exploring new uses for milk solids in home cooking and bread making.

All the countries visited have differential payments for milk on a quality basis and this has improved the quality of dairy produce generally. In Western Europe and the United States, all milk irrespective of use is paid for on butterfat content.

Conservation of fodder as hay and silage is being practised extensively. In England and Holland, special attention is being paid to the drying of grass with a high level of protein.

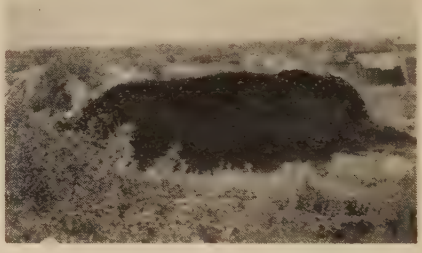


Plate 2.
**Wedge Silage Opened up for Feeding in England.**

Better nutrition, herd recording and progeny testing have helped to increase dairy production. In most of the countries visited production per cow ranged from 625 to 825 gallons of milk per year. On several farms visited, the herds were yielding from 1,100 to 1,500 gallons per cow.

Artificial insemination is widely employed. Three-quarters of all herds in Denmark use the method, and one-third in England. The holding of semen for long periods by deep freezing promises a revolution in breeding work and in proving a sire before he is widely used. The technique will facilitate the transport of semen from proved sires overseas as far afield as Australia.

There is much active research in England and America aimed at effecting economy in farm production and manufacture.

Plate 3.

**A Grass Drier in Operation in Southern England.**

Plate 4.

**Dried Pasture (Ground and Pelletted), Dartington Hall, England.**

Bucket milking machines are still commonly used in Europe and the United Kingdom, but pipeline milking is increasing. In the United States, by the use of elevated milking parlors it has been possible to reduce labour needs by a third. Milking machines are not dismantled daily but are cleaned and sterilized by recirculating combined detergent-sanitisers or cold detergents and chemical sterilants through the assembled machine.

Sterilized milk, a development of Western European countries, is expanding rapidly in the United Kingdom. Less frequent deliveries and a saving in refrigeration are two of the obvious advantages.

## Diversification of Dairy Products.

Most of the countries visited prepare numerous dairy products—cheese, butter, market milk, condensed and powdered milk, whey, buttermilk

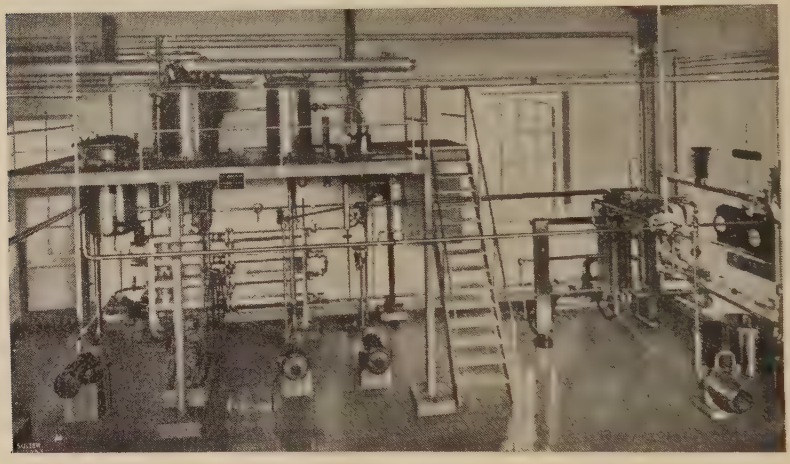


Plate 5.

**A Plant in Switzerland for the Sterilization of Milk by "Uperization."**

The enclosed cooling of milk in refrigerated storage vats on the farm eliminates the daily collection of bulk milk from the farm, with economy in transport, reduced handling and minimum cleaning of equipment.

The farm collection of milk by tanker has overcome some of the difficulties of handling heavy cans, and greater economy in transport is assured by the payable load, usually every second day. Quality has also been improved by completely enclosed milking, cooling and storage of the milk.

Electricity is widely used for milking operations, filling silos, grinding grain, mixing feed and carrying drainage.

powder, etc. Among the market milks are flavoured milk, skim milk and low-fat milk. Fancy cheese, such as cream cheese, are profitable products much in demand. Most factories receive whole milk and are equipped to divert the supplies into whatever produce is in most demand and according to market requirements.

Improved packaging of dairy produce has gone hand in hand with advertising. Packaging of market milk in waxed cartons and coatings and packaging of cheese in an attractive manner deserve mention.

There is a greater appreciation of the value of the solids-not-fat of milk for human consumption. Payment for

Plate 6.
**Attractively Packaged Dutch Cheese in Holland.**

milk on a total solids basis offers encouragement for the production of non-fat-solids commodities.

## Possible Application to Australia.

If export markets are to be maintained and improved, quality improvement and reduction of costs on the farm and in the factory must accompany increased production. Australian dairy farmers and processors might well follow the lessons to be learnt from overseas practices.

The higher level of feeding of dairy cattle overseas with hay and silage suggests that this is by far the greatest single contributing factor in higher production at lower cost. To attain higher production here, it is necessary to feed more hay and silage during periods of normally low production. Better roughage is more important than concentrates.

Australian reliance on a butter economy appears to be unwise and diversification of dairy products would be a distinct advantage. Market milk and fancy cheese in their many forms offer room for expansion. Mechanisation, improved packaging, and advertisement could help in increasing consumption of dairy products at home and abroad.

The developments noted are essential for the future economic stability of the dairying industry in this country. The technical services available to the industry in Queensland are equal to those in any country. It is, however, necessary for the industry to take more advantage of the services offered and assist in the application of much of the information already available.

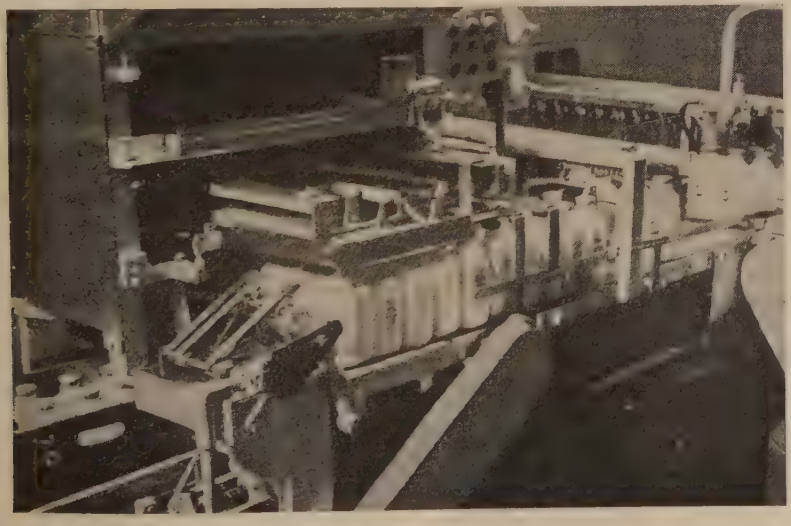


Plate 7.
**Automatic Crating of Bottled Milk in England.**

# Machine Stripping of Dairy Cows.

PREPARED BY THE DIVISION OF DAIRYING.

The need to increase dairy production must be closely associated with an effort to increase efficiency on farms, thereby ensuring that greater production is accompanied by a decrease in costs. To this end any means of reducing labour costs is worthy of consideration.

Machine stripping of dairy cows has been found to simplify the routine of milking and reduce the labour required for this task. It is therefore well worthy of introduction to the milking procedure.

## Secretion and "Let-down" of Milk.

An understanding of the process of milk secretion and the mechanism whereby the cow is induced to let-down her milk is necessary for an intelligent approach to machine stripping. This is dealt with more fully in a pamphlet available on request, but can be summarised as follows.

The udder consists of four separate glands, a large part of which is occupied by a great number of small, round gland lobules. These gland lobules are connected by tiny tubes to milk ducts which convey the milk to the milk cistern—a reservoir above each of the four teats. The inside of each gland lobule is lined with a large number of microscopic alveoli, the walls of which are lined with the cells in which the milk is formed.

These cells manufacture the components of milk from substances in the blood stream and discharge their contents into the alveoli. The milk collects in the milk cistern, ducts and gland lobules, being prevented from escaping by the action of muscles within the teat.

The secretion of milk by the alveolar cells is continuous, but slows down and may finally stop as the quantity of milk in the udder increases. The slowing down is caused mainly by the pressure of the milk flattening the small blood vessels which supply the alveoli, thereby cutting down the supply of blood and materials for the manufacture of milk to the alveolar cells. This increasing pressure also causes the larger fat globules to be retained in the alveolar cells and gives rise to the higher fat test of the last-drawn milk.

When the cow comes in for milking the udder is distended with milk distributed throughout the milk cistern, ducts and gland lobules and held in place by contraction of the muscles in the teats. To obtain all the milk, the teat muscles must be made to relax, and pressure should be exerted by the small muscles associated with the gland lobules to squeeze the milk into the cistern and larger ducts from which it can be easily collected.

This whole process actually occurs quite rapidly under proper conditions as the result of the action of hormones. A stimulus is given to the cow, usually by washing the teats in warm water, and this results in the liberation of a hormone into the blood stream. After about 45 seconds, when this hormone is carried by way of the blood stream to the udder, it causes the muscular changes described above and milk let-down results.

Any adverse stimulation of the cow to cause fear, anger or excitement leads to the secretion of another hormone, which stops the let-down process and makes it very difficult to milk the animal completely.

## Machine Stripping.

The purpose of hand stripping of cows is to recover that last portion of milk which is high in fat. It can be argued, however, that if stripping is completely omitted the fat lost at one milking will be largely regained at the next. Practical trials have indeed shown that milk and butterfat production are not appreciably altered by the omission of stripping.

However, complete milking out may have a beneficial effect in reducing the pressure of milk in the udder to its

lowest point and thereby ensuring the maximum time of secretion before the increasing pressure stops the formation of milk.

Machine stripping simply involves bearing down gently on the cups after active milk flow ceases, so the labour involved is negligible compared with the effort required for hand stripping. Also, the practising of machine stripping causes the disappearance of any disadvantages which may be attendant on the complete omission of stripping.

The majority of cows can be simply trained to deliver all their milk by machine stripping, but a small proportion of the herd may be found untrainable. It is for the farmer to decide, on economic grounds, whether such cows should be retained in the herd and milked last or progressively replaced by trainable heifers.

This difficulty can be overcome by successful herd management, such as is seen in the ultimate where large-scale milking using a rotary milking platform is practised. Here, about five cows per minute are milked efficiently by the application of modern methods, including machine stripping.

On the smaller scale of individual farms, observations by field officers on Queensland dairy farms and demonstration farms have shown that machine stripping reduces labour costs without reducing milk or cream yields and without increasing udder troubles.

## Training Cows to Machine Stripping.

The first essential before even attempting machine stripping is the successful adoption of modern milking methods. These are described fully in a pamphlet, "Modern Milking Methods." They are based on the theories of milk secretion and let-down as outlined above and therefore involve—

(1) Quiet handling and correct training of the cows.

(2) Efficient stimulation of the cow to let-down her milk.

(3) The application of the cups of an efficient milking machine *one minute* after the stimulus has been applied.

(4) Pulling down cups which creep.

(5) Removal of the cup as soon as possible (that is, rapid milking).

When the herd is responding well to such methods, the cows can be trained to machine stripping in the following fashion.

(1) Remove the cups 4 *minutes* after milking has commenced (or earlier if free milk flow ceases), and hand strip to determine the amount of strippings.

(2) For several milkings, as soon as free flow ceases, *bear down gently on the cups.* The milk flow may become active again for a short time. As soon as this finishes remove the cups. *Do not hand strip.*

(3) Then test again as in (1) to find which cows have milked out completely.

The advantages of machine stripping include:—

(1) No loss of production or acceleration of drying-off.

(2) A possible improvement in milk quality due to the smaller amount of handling.

(3) Lessened chances of spreading mastitis by the milkers' hands.

(4) A very definite saving of labour.

(5) Faster milking—more cows can be milked in a given time.

(6) More attraction in milking for farm labour.

## Summary.

The successful adoption of machine stripping can result in a considerable saving of time and labour. It involves the introduction and efficient application of modern milking methods followed by training the cows to milk out completely after gently bearing down on the cups when active milk flow ceases.

# Preserving Citrus and Grape Juices.

R. E. LEVERINGTON, Horticulture Branch.

Citrus juice is one of the most difficult juices to preserve satisfactorily as it contains an enzyme which turns the juice bitter when preserved by heat or cold.

Satisfactory cordials may be prepared as follows:—

## Orange or Grapefruit Cordial.

44 fl. oz. juice;
7 lb. sugar;
2½ oz. citric acid;
½ oz. essence orange or grapefruit;
1 heaped dessertspoon sodium benzoate;
Make up to 1 gallon with water.

## Lemon Cordial.

44 fl. oz. juice;
7 lb. sugar;
1 heaped dessertspoon sodium benzoate;
½ oz. essence of lemon;
Make up to 1 gallon with water.

Before extracting the juice from *oranges, lemons* or *grapefruit* wash them well to remove dirt, mould spores, yeasts and harmful micro-organisms which are liable to cause contamination and produce "off" flavours. The fruit is then halved and the juice extracted by hand reaming. A coarse screening is necessary to remove peel and rag, followed by a finer screening to remove fruit cells.

Dissolve the sugar and citric acid in the juice to which 1 pint of water has been added. Dissolve the sodium benzoate in a little hot water and add it to the syrup. Add the essence and make up to one gallon with water.

These cordials can be bottled without heat and kept for long periods. Flavour deterioration may occur after long storage but can be retarded by keeping in a refrigerator. The cordial is diluted with water for use.

The juice can also be preserved by heat and the following method is recommended for oranges, grapefruit and lemons.

The extracted juice is deaerated by heating it slightly in small batches, agitating slowly all the time, thereby causing bubbles to rise. It is then filled into clean, sterile bottles leaving about 1-2 inches of headspace and the bottles are firmly sealed. The bottles are placed in a sterilizer or a lidded metal container. The sterilizer should be filled with sufficient water to reach the shoulders of the bottles and then heated to a temperature of 160°F.–180°F. and maintained at that temperature for 35 minutes. The bottles are then removed from the sterilizer and placed on a damp cloth until cold. Storage in a refrigerator will aid preservation. The juice from fully ripe, sound fruit deteriorates less in flavour than that from immature or overmature fruit.

## Grape Juice.

Grape juice can be preserved by filling the strained juice into clean, sterile bottles and following the directions recommended in the foregoing for citrus juices.

# Bottling Fruit and Vegetables.

R. E. LEVERINGTON, Horticulture Branch.

In home bottling, the same principles are used as in commercial canning. The essential difference is that the householder has to rely on manual labour and glass containers. Home bottling can be made much easier with labour-saving devices, such as special knives for peeling, coring and trimming, juice extractors, baskets for holding jars, kitchen traymobiles, &c.

Bottling relies upon the application of heat to destroy the food spoilage organisms which are found at all times in air, water and soil. Everything which has to do with home bottling should therefore be clean—the room, the food, the utensils, the bottles, and the person doing the processing.

After thoroughly cleaning the jars and lids with soap, rinse them and then sterilize by placing them in cold water and bringing the water to the boil. Leave the jars and lids in the hot water until required or place them upside down on a clean surface.

## Containers.

Any glass jar is suitable for use provided it can be made airtight. Screw-top and clip-top jars are favoured but their efficiency depends upon the care of the operator. The most efficient jars become useless if care is not taken to see that they are completely airtight when the lids are applied.

Rubber rings fitting closely between the lid and jar are essential in making the jars airtight. Use only jars and lids made by the same manufacturer, as lids are made to fit only certain jars. Some lids are lacquered whilst others are fitted with glass or porcelain lining to prevent action on the metal lid by acids in the product. Only perfectly clean jars and lids should be used. Discard any with cracks, chips, dents, &c., as these prevent airtight seals. If spring clamp tops are used it is often necessary to readjust the springs slightly to maintain the required pressure on the lids after processing.

Glass jars need to be carefully handled to prevent breakages; filling suddenly with hot liquids will easily crack them. Placing cold glass in contact with hot utensils or jars filled with hot fruit and placed in a cold draught may cause cracking of the jar. Binding the glass with a wet cloth before filling may prevent cracking.

Before commencing bottling operations, make sure that all jars are airtight by half filling them with water and then inverting them with the lids on.

## Bottling Fruits.

Sugar or water must be added to fruits to supply liquid. The strength of syrup can be varied to suit individual tastes, but as a general rule a syrup prepared by dissolving 4 lb. of cane sugar in 4½–5 pints of water is quite satisfactory. The syrup should be brought to the boil, kept boiling for five minutes and any scum skimmed off the top.

There are two methods of bottling—the cold pack for soft fruits and the hot pack for firm fruits. In some cases either process may be used. In the cold pack the fruit is packed into the jar, covered with boiling water or syrup and cooked in the jar. In the hot pack the fruit is brought to the boil in syrup or water in an open container, simmered for 3–5 minutes and then packed hot into jars. In both packs a headspace of ¼ inch for pint jars and ½ inch for quart jars should be left in order to allow room for the fruit to expand on heating.

After the jars are filled, wipe them with a clean damp cloth and then release the air bubbles in the jar by running a knife down between the fruit and the walls of the jar. Screw the lids on lightly and place the jars in very hot or boiling water deep enough to well cover the tallest jars.

Sterilization is the most important feature of home bottling. The boiling water bath is quite satisfactory for sterilizing acid foods such as fruits and tomatoes. In these foods, bacteria, yeasts and moulds cause spoilage and these organisms can be killed by a temperature about the boiling point of water. Fruits of low acidity, such as papaws, bananas, mangoes and rockmelons, require a small amount of citric acid before sterilization as indicated in the detailed instructions.

A large pudding boiler or a copper with a cake rack in the bottom on which to stand the jars is satisfactory for sterilizing purposes. Never use an oven for sterilizing glass jars, as the heat of the oven may seal the jars and make them explode.

Sterilizing times depend upon the type of fruit, the method of bottling and the height above sea level where the bottling is being done. You will need to add one minute to the cooking time for each 1,000 feet above sea level if the cooking time given in the directions is 20 minutes or less. If the cooking time is more than 20 minutes you will need to add 2 minutes for each 1,000 feet.

INSTRUCTIONS FOR INDIVIDUAL FRUITS.

| Fruit. | Type of Pack. | Other Instructions. | Cooking times in boiling water bath. | |
|---|---|---|---|---|
| | | | Pint jars. | Quart jars. |
| | | | Min. | Min. |
| Apples | Hot | | 20 | 25 |
| Apricots | Cold | | 20 | 25 |
| | Hot | | 15 | 20 |
| Bananas | Cold. Use slices ½″–1″ | Add 1 oz. of citric acid per gallon of syrup | 25 | 30 |
| Cape Gooseberries | Cold | | 15 | 20 |
| Mangoes | Cold | Always peel with knife—do not tear skin off. Add ¼ oz.–½ oz. citric acid per gallon of syrup | 30 | 40 |
| Papaws | Cold | Add 1 oz. citric acid per gallon of syrup | 30 | 40 |
| Passion Fruit | Cold | If desired, add sugar to pulp (4 oz. per pint). The addition of syrup is unnecessary | 25 | 30 |
| Peaches | Cold | | 30 | 40 |
| | Hot | | 25 | 35 |
| Pears | Cold | | 30 | 40 |
| | Hot | | 25 | 35 |
| Pineapples | Cold | | 15 | 20 |
| Plums | Cold | | 15 | 20 |
| | Hot | | 10 | 15 |
| Rockmelons | Cold | Add 1½ oz. citric acid per gallon of syrup | 30 | 40 |
| Strawberries | Cold | | 20 | 25 |
| Tomatoes | Cold | Add ½ teaspoon salt per | 30 | 40 |
| | Hot | pint jar and 1 teaspoon salt per quart jar | 15 | 20 |
| Fruit Salad | Cold | In Central and Northern Queensland fruits are usually less acid than those grown in southern Queensland and it is necessary to add 1 oz. citric acid to each gallon of syrup | 30 | 40 |

After sterilization, the jars should be removed immediately from the boiling water and the lids screwed on tightly. Then place the jars on a wooden bench in a cool position and separate them so that air can circulate on all sides. This is necessary, as slow cooling can cause spoilage. Bottled fruit should be kept in a cool, dark place for a few weeks before use.

Never use or taste bottled fruit which shows any sign of spoilage. Bulging jar lids or rings, a leak, spurting fluid when the jar is opened, an odd smell, mould, or a very cloudy syrup may mean spoilage. In case of doubt always destroy the contents.

Never use chemical preservatives in home bottling, as some of these substances may prove harmful.

To prevent discolouration, peaches, pears, apples and bananas should be dipped as soon as they are peeled into a salt or brine solution made by dissolving one teaspoon of salt or brine in one quart of water. Leave the fruit in the brine for only a short period, as long standing will give a salty taste. The fruit should then be drained thoroughly before packing.

## Bottling Vegetables.

It is not safe to use a boiling water bath for bottling vegetables other than tomatoes. The low acidity of vegetables and their contact with the soil render them liable to cause food poisoning by botulism bacteria.

Botulism organisms and their resistant spores can only be killed by heating at a temperature of at least 240°F. for more than half-an-hour. To obtain these conditions a *pressure cooker canner* maintained at 10 lb. pressure is necessary and it must be fitted with an accurate thermometer or dial-type pressure gauge. Unless the pressure cooker has either of these measuring devices, the housewife will not know whether the sterilizing conditions are satisfactory.

The importance of botulism cannot be over-emphasized. Unlike many types of food poisoning bacteria, the botulism organism produces its poison during the process of food spoilage. The bacteria may grow in the food without producing any smell or other obvious signs which would warn the housewife that the food was unfit to eat. Food poisons may be produced in bottled fruits and tomatoes if mould growth develops, and mouldy bottled fruits should never be eaten.

Vegetables should be thoroughly washed and the edible portions prepared as for normal cooking. A precooking or blanching process in boiling water or steam is required to prevent subsequent deterioration in quality and appearance. Blanching also often softens the vegetables, thus making packing easier.

Immediately after blanching, the vegetables should be packed hot into the jars; half a teaspoon of salt should be added to pint jars and one teaspoon to quart jars. Work the blade of a knife down the sides of the full jars to remove air bubbles. Add more liquid if needed to cover the food, leaving a headspace of one inch for peas and corn and ½ inch for all other vegetables. The jars should be wiped and then sealed.

Then place the jars in the pressure cooker canner containing about three inches of boiling water. Fasten the lid on the canner and allow the steam to escape freely for 10 minutes before fitting the pressure regulator; allow the pressure to rise to at least 10 lb. per square inch. Process for the required length of time, keeping the pressure steady all the time. If you live above sea level, it is necessary to have the pressure adjusted to 1 lb. per square inch higher for every 2,000 feet of altitude.

When the recommended time has elapsed, remove the source of heat and allow the pressure to fall. Do not chill quickly by pouring water over the cooker. Then remove the lid as directed by the manufacturer. Carefully remove the jars and stand them at least one inch apart to allow them

to cool. Do not place the jars in a draught, as they may crack. Store in a cool, dark place.

### Points to Observe in Home Bottling.

(1) Use only good fruit and vegetables for bottling. If they must be held for a short time, keep them cool and well ventilated. Fresh products lose colour, flavour and food value quickly under warm conditions and spoilage organisms will grow faster.

(2) Wash all foods carefully even when they are to be peeled. Washing helps to remove spoilage organisms as well as dirt. Use clean utensils, too.

(3) Choose jars and lids with care. Be sure they are perfect. Put lids on properly. Imperfect seals will result in spoilage, since air and spoilage organisms can get into the jars after processing.

(4) Work fast after you start to prepare foods for bottling. Get the food into jars as quickly as possible. Process it at once. Delay in bottling may cause bacterial spoilage. Fruits left to stand too long before bottling may darken. Such foods can be eaten but their appearance and flavour will be impaired.

(5) Do not pack jars too tightly, otherwise the food may not be heated sufficiently in the time given for cooking. Under-cooking may cause spoilage.

(6) Follow carefully the cooking times given for each product. Be certain that water covers the jars by 1 or 2 inches. Keep the water boiling for the full time given. If you are bottling at altitudes above sea level, increase cooking times as directed. Under-cooking of products is one of the main causes of spoilage. It may also cause the food to discolour.

(7) Do not cook products longer than necessary. Over-cooking will make them soft and mushy. It may even cause pears and apples to turn pink.

(8) If the self-sealing type lid is not used, complete the seals as soon as jars are taken from the canner. Delay in sealing jars may cause spoilage.

(9) Cool jars at room temperature, but space them so that air can get to all sides. Slow cooling may cause spoilage.

(10) Store bottled foods in a cool place. Even when carefully bottled some foods may spoil if kept too warm.

INSTRUCTIONS FOR INDIVIDUAL VEGETABLES.

| Vegetables. | Pre-cooking time in minutes in boiling water. | Sterilizing times in a pressure cooker canner at a temperature of at least 240°F. or a pressure of at least 10 lb. per sq. inch. | |
|---|---|---|---|
| | | 1 pint jars. | 2 pint jars. |
| | | Min. | Min. |
| Asparagus | 3 | 35 | 40 |
| Cabbage | 3 | 35 | 40 |
| Beans | 3 | 35 | 40 |
| Cauliflower | 3 | 35 | 40 |
| Beetroot | Boil whole until skins slip off easily, skin, then slice | 35 | 40 |
| Carrots | 5 | 35 | 40 |
| Corn | 4 (Pack loosely in bottles) | 65 | 75 |
| Spinach | 5–8 | 60 | 70 |
| Peas | 1–2 | 45 | 50 |